Raytheon

Laboratory for Astronomy and Solar Physics Contract

Support Services for the Laboratory for Astronomy and Solar Physics

FINAL METRIC
AND
PROGRESS REPORTS

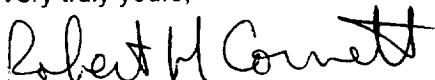## Contract No. NAS5-32993

September 30, 2001

Dawn Fountain,
Contracting Specialist--Code 216
Building 26, Room 235
National Aeronautics and Space Administration
Goddard Space Flight Center
Greenbelt, MD 20771

Dear Ms. Fountain:

We are pleased to submit the Final Progress Reports and Metric Reports
for all tasks under contract NAS5-32993 for LASP Support Services.

If you have any questions, please call me at 301-286-3623.

Very truly yours,

Dr. Robert H. Cornett
Project Manager, Raytheon ITSS Corp.

Edward C. Sullivan, COTR, LASP Assistant Division Chief, Code 680.0 (Bldg. 21, Rm. 114B)
Dr. Richard R. Fisher, LASP Division Chief, Code 680.0 (Bldg. 21, Rm. 114A)
Dr. Charles Bowers, Technical Officer, Code 681.0, (Bldg. 21, Rm. 004)
Dr. Edward Cheng, Technical Officer, Code 685.0 (Bldg. 21, Rm. 169B)
Dr. Steven A. Curtis, Technical Officer, Code 695.0 (Bldg. 2, Rm. 136)
Dr. Joseph Davila, Technical Officer, Code 682.0 (Bldg. 21, Rm. 268)
Dr. Brian Dennis, Technical Officer, Code 682.0 (Bldg. 21, Rm. 152)
Dr. Eliahu Dwek, Technical Officer, Code 685.0 (Bldg. 21, Rm. 177A)
Dr. Jonathan P. Gardner, Technical Officer, Code 681.0 (Bldg. 21, Rm. 262)
Dr. Cornelis Gehrels, Technical Officer, Code 661.0, (Bldg. 2, Rm. 250B)
Dr. Theodore R. Gull, Technical Officer, Code 681.0 (Bldg. 21, Rm. 052)
Dr. Sara R. Heap, Technical Officer, Code 681.0 (Bldg. 21, Rm. 020)
Dr. Gary Hinshaw, Technical Officer, Code 685.0 (Bldg. 21, Rm. 138)
Dr. Randy Kimble, Technical Officer, Code 681.0 (Bldg. 21, Rm. 016)
Dr. Alan Kogut, Technical Officer, Code 685.0 (Bldg. 21, Rm. 246)
Dr. David Leisawitz, Technical Officer, Code 631.0 (Bldg. 26, Rm. 140)
Dr. John C. Mather, Technical Officer, Code 685.0 (Bldg. 21, Rm. 108)
Dr. Harvey Moseley, Technical Officer, Code 685.0 (Bldg. 21, Rm. 130)
Dr. Susan G. Neff, Technical Officer, Code 681.0 (Bldg. 21, Rm. 044)
Joseph Novello, Technical Officer, Code 686.0 (Bldg. 21, Rm. 070)
Dr. Joseph Nuth, Technical Officer, Code 691.0 (Bldg. 2, Rm. 131)
Dr. Ronald Oliversen, Technical Officer, Code 681.0 (Bldg. 21, Rm. 036)
Dr. Robert F. Pfaff, Technical Officer, Code 696.0 (Bldg. 2, Rm. 213)
Dr. Robert Silverberg, Technical Officer, Code 685.0 (Bldg. 21, Rm. 158)
Dr. Eric P. Smith, Technical Officer, Code 681.0 (Bldg. 21, Rm. 028)
Dr. George Sonneborn, Technical Officer, Code 681.0, (Bldg. 21, Rm. 034)
Dr. Theodore P. Stecher, Technical Officer, Code 681.0 (Bldg. 21, Rm. 136)
Christine Baxley, Resource Analyst, Code 603.2, (Bldg. 21, Rm. 018)
Cecelia Johnson, Resource Analyst, Code 603.0 (Bldg. 21, Rm. 018)
NASA Scientific and Technical Information Facility, Attn: Accessioning Department,
800 Elkridge Landing Road, Linthicum Heights, MD 21090
Charmaine Jordan, Raytheon ITSS Corp., Financial Analyst, Lanham
Rosa Fox, Raytheon ITSS Corp., Contracting Office, Lanham

GSFC ATR: Dr. Ronald J. Oliversen
CSC Subcontract Task
CSC Task Leader: Dorothy Appleman

QUARTERLY REPORT: MARCH 1, 2000 – JUNE 19, 2001

TASK OBJECTIVES

The objectives of this task are to support activities relative to logistical arrangements for NRA proposals. Support will be provided for the base system, and IUE, ADP, EUVE, ATP, ISO, and LTSA grant data for the EUVE proposal administration.

WORK ELEMENTS

100 Coordination, management and s/w development

Task personnel coordinated activities with the Chief, Science Programs Resources Management Division personnel at NASA Headquarters and with the Program Scientist for the ATP, LTSA, ADP, and FUSE programs.

Task personnel continue to work to refine forms and reports to increase efficiency.

200 Grants database and system support

Database support was provided as requested by the ATR and the ADP/ATP/LTSA/FUSE Project Scientists. Statistics about those projects were provided as needed.

ATP, ADP, and LTSA grant renewal packages processing has been suspended pending receipt of FY2001 funds and spending authority from NASA HQ, as is processing of new ATP, ADP, LTSA and FUSE programs.

300 Grant processing

All spreadsheets of newly awarded grants for peer reviewed programs as well as for Education and Public Outreach awards have been received and incorporated into database tables for ADP, ATP, and LTSA programs.

For the ADP programs, 67 programs are to be funded with FY 2001 funds. Of these 36 are new and 31 are renewals. Of the 36, 24 are complete and 7 are in progress. Of the renewals, 4 are in progress or awaiting renewal letters and the remainder is complete.

For the ATP programs, 107 programs are to be funded with FY 2001 funds. Of these 37 are new and 70 are renewals. Of the 37, 30 are complete and 7 are in progress. Of the renewals, 20 are in progress or awaiting renewal letters and the remainder is complete.

For the LTSA programs, 153 programs are to be funded with FY 2001 funds. Of these 26 are new and 127 are renewals. Of the 26, 20 are complete and 6 are in progress. Of the renewals, 4 are in progress or awaiting renewal letters and the remainder is complete.

For the FUSE programs, approximately 87 programs are to be funded with FY 2001 funds. Of these 66 are complete. Of the remaining, 9 are awaiting award, and 12 are awaiting initiation. The FUSE program contains some TOO programs which may or not be funded.

400 PI, official, and other requests for administrative information

Requests were processed as required.

Non-Local Travel

None

METRIC EVENTS

301   **Mean time to process new batch grants to average 0.5 hours per grant**
        Mean time to process old grants to average 0.25 hours per grant

        Total NEW for ADP, LTSA FUSE, and ATP: 140

        Comments: Total RENEWAL packages for ADP, LTSA, and ATP: 228. Details are shown under
        Work Element 300, above.

401   **Research and investigation to resolve requests up to 6 hours per day**

        Approximately 250 calls and emails were received and responded to this quarter.

GSFC ATR: Dr. John C. Mather
Raytheon ITSS Task Leader: Dr. Sten Odenwald

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The Contractor shall provide software, analysis, and research support for the Long Term Space Astrophysics grant to study the correlation function of the fluctuations in the infrared background radiation.

WORK ELEMENTS

100 Analysis of 2MASS data

Staff completed the coadds for 2MASS data. Work began on a study of instrument noise properties by computing 'A-B' images and their power spectra.

200 Publication support

The next publication, probably for *ApJ* (*Letters*), will discuss 2MASS data and the above analysis. The draft awaits additional analysis.

Non-Local Travel

None

METRIC EVENTS

101   **Draft publication of a paper on the results of current 2MASS field studies**
         Completion date: June 30, 2001

         Percent Complete: 5%

         Comments: We have identified a tentative detection of a signal in the data that could be related to the CIRB, but we need to complete an analysis of the detector noise to establish that the signal seen is not contributed by the instrument. We are also out of LTSA funding by June 30, so that the balance of the 2MASS work will have to be carried out under some other contract/grant resource.

GSFC ATR: Dr. Susan G. Neff
Raytheon ITSS Task Leader: Dr. Robert H. Cornett

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

This task comprises study support for the Iris Advanced Mission Concept and for the eventual preparation of a proposal for an advanced Ultraviolet Imaging mission.

WORK ELEMENTS

Task member Scott Campion, a summer student employee, joined the task on June 4. His work will be divided between this task and task 98U-0046.

100 Operations and Instrument concept development

200 Prototype instrument or simulator construction, testing, and operation

300 Scientific, engineering, and environmental studies

400 Science optimization studies

Staff began familiarization with software, databases, and data.

500 Instrument performance characterization

600 Manuscript preparation support

700 Team travel support

Non-Local Travel

None

METRIC EVENTS

101   Participation in development of instrument simulators and design reference missions
Completion date: TBD

> Percent complete:

> Comments:

201   Initiate design and development of study reports in accord with project schedules, e.g. workshops for community
Completion date: TBD

> Percent complete:

> Comments:

GSFC ATR: Dr. Harvey Moseley
Raytheon ITSS Task Leader: Dr. Richard G. Arendt

QUARTERLY REPORT: MARCH 1 - JUNE 19, 2001

TASK OBJECTIVES

This task supports instrument and mission design with the purpose of optimizing the calibration of infrared astronomical space instrumentation such as SIRTF/IRAC. It includes, but is not limited to, the following activities:

WORK ELEMENTS

100 Hardware design support

200 Pre-flight calibration

Additional analysis of IRAC linearity test data for tests run at GSFC and Ball have revealed that the models of Band 3 and 4 non-linearity trends are significantly improved by extending the models from 2nd to 3rd-order polynomials. The tests run at Ball were found to be largely consistent with the tests at GSFC.

300 Pre-flight review support

A memo was submitted to the IRAC team describing some of the limitations placed on the calibration of IRAC data in the event that it is decided to not operate the shutter once in orbit.

400 Software development

The least-squares calibration code was modified to add an optional capability to calculate the diagonal of the weight matrix.

IDL programs were written that calculate the expected intensity distribution for confusion-limited observations for a specified source count function and beam width. These programs can also create simulated maps based on the given source counts, and evaluate the limiting apparent brightness of distinguishable point sources.

An IDL code was written to calculate the roots of a cubic polynomial. This function is needed to linearize data using higher-order models of the detector non-linearity. A memo was prepared showing how the 3rd-order polynomial non-linearity model can be applied for Fowler-sampled data, and how the non-linearity coefficients of the detector can be fit using the linearity test data.

500 Mission operations design support

Staff participated in MO&DA and IOC telecons. Memos were submitted to provide estimates of the time that will be required to collect data that are sufficient for least-squares calibration of the detector flat fields, and to explain what impact the variation in effective wavelength across the array has on results derived using a least-squares calibration.

600 Data analysis

Analysis of the HST NICMOS observations of the HDF North and South fields was completed. Some residual errors were traced to the effect of scattered earthlight in the data. The final source counts were generated after a bug was identified in the source extraction software and an upgraded version was obtained. The paper that describes this analysis of the HDF observations using our least-squares self-calibration procedure was completed and submitted to the *Astrophysical Journal* on May 1. The referee's report is expected shortly.

700 Organizational and documentation support

A paper titled "Optimal fitting of Non-linear Detector Pulses" has been prepared and is nearly ready for submission. A copy of the least-squares self-calibration code was delivered to the GOODS SIRTF Legacy team (c/o S. Casertano) at STScI.

The procedure that was used for fitting the NICMOS MULTIACCUM ramps was delivered to a member of the NICMOS calibration pipeline team (H. Bushouse) at STScI.

Some of the relevant reports and notes developed for IRAC have been delivered to J. Gardner (GSFC) for consideration in the planning of an NGST NIRCAM proposal.

Viewgraphs illustrating the confusion-limited point source extraction limits were provided to H. Moseley.

Non-Local Travel

None.

METRIC EVENTS

401   **Support SIRTF teams in use of least squares algorithms**
       Completion date: TBD per SIRTF team schedule

       Percent complete:

       Comments: Continuing effort.

402   **Deliver codes for scientific analysis of confusion-limited data**
       Completion date: May 31, 2001

       Percent complete: 100%

       Comments: Completed code for using input source counts and instrument beam width to generate $P(D)$ distributions and confusion limits on apparent point source fluxes. It is currently being used by E. Dwek.

501   **Participate in planning for initial IRAC observations, and develop tools required for production of IRAC images**
       Completion date: TBD per IRAC team schedule

       Percent complete:

       Comments: Continuing effort.

601　Complete analysis of NICMOS HDF and prepare for publication. This includes development of new error analysis algorithms and software.
Completion date: April 30, 2001

Percent complete: 100%

Comments: Paper was submitted to the *ApJ* on May 1, 2001. The referee's report has not been received.

602　Review and report on analysis of spatially confused data. Prepare or collect tools for the analysis of such data.
Completion date: August 31, 2001

Percent complete: 30%

Comments:

GSFC ATR: Edward C. Sullivan
Raytheon ITSS Task Leader: Dale Humberson

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

This task supports Laboratory logistics through development and maintenance of inventory databases, personal computer (PC) and network maintenance and upgrades, and general maintenance scheduling and tracking.

WORK ELEMENTS

100 Inventory data base development and maintenance

See attached Database Summary Report, supplied as Metric Event 101, below.

200 Personal computer and network maintenance

During this reporting period:

    662 PC hard drive backups were performed.
    786 Macintosh hard drive backups were performed.

Details are reported in the Quarterly Report for task 97L0026.

300 Logistics and scheduling support

During this reporting period:

    87 items of furniture were excessed.
    73 items of controlled equipment were excessed and decontrolled.

Non-Local Travel

None

METRIC EVENTS

101   DATABASE SUMMARY REPORT (supplied quarterly):

New items for March, April, May, June

ECN	ITEM NAME	MANUF.	MODEL	USER NAME
2108377	COMPUTER, MICRO	SUN	1000	SULLIVAN, EDWARD
2108378	DISPLAY UNIT	SUN	GDM5410	SULLIVAN, EDWARD
2108379	DISK DRIVE UNIT	SUN	711	SULLIVAN, EDWARD
2108380	TRANSPORT, MAG TIPE	SUN	622	SULLIVAN, EDWARD
2109210	COMPUTER, MICRO	DELL	PP01X	HORN, MIKE
2109211	DISPLAY UNIT	DELL	E771P	HORN, MIKE
2108694	COMPUTER, MICRO	DELL	WCP	FEGGANS, JOHN
2108706	PRINTER, LASER	HP	C7087A	FEGGANS, JOHN
2108715	DISK DRIVE UNIT	SUN	STOREDGE T3	BECK, TERRENCE
2108736	DISPLAY UNIT	SUN	GDM5410	OLIVERSEN, RONALD
2108816	COMPUTER, MICRO	DELL	PPO1L	FEGGANS, JOHN
2108865	LAPTOP	APPLE	G4	SMITH, ERIC
2109208	COMPUTER, MICRO	SUN	SUN BLADE 1000	BECK, TERRENCE
2109209	DISPLAY UNIT	SUN	LSA800	BECK, TERRENCE
2109299	COMPUTER, MICRO	SUN	1000	BECK, TERRENCE
2109300	DISPLAY UNIT	SUN	LSA800	BECK, TERRENCE
2109301	TRANSPORT, MAG TIPE	SUN	622	BECK, TERRENCE
2109843	PUMP VACUUM	DANIELSON	100/038	HILTON, GEORGE
2108712	DISK DRIVE UNIT	QUANTUM	70-700104-001	GURMAN, JOSEPH
2108713	DISK DRIVE UNIT	QUANTUM	70-700104-001	GURMAN, JOSEPH
2108806	COMPUTER, MICRO	DELL	PPO1X	ORWIG, LARRY
2109174	TELESCOPE	CELESTRON	NEXTSTAR 8	BROWN, SARAH
2110009	COMPUTER, MICRO	TCS	PENTIUM III 933	DOUPONT, PAUL
2109657	DISPLAY UNIT	APPLE	M2454	GINTHER, CHRIS
2109658	COMPUTER, MICRO	APPLE	M7886	GURMAN, JOSEPH
2109904	COMPUTER, MICRO	DELL	MMP	TOLBERT, ANNE
2109905	COMPUTER, MICRO	DELL	MMP	TOLBERT, ANNE
2110097	DISK DRIVE UNIT	LA CIE	SDX500C	GURMAN, JOSEPH
2108372	SWITCH	CISCO	WS-C2912XL-EN	COTTINGHAM, DAVID
2108783	COMPUTER, MICRO	SUN	220R	BECK, TERRENCE
2108784	TRANSPORT, MAG TIPE	SUN	611	BECK, TERRENCE
2108827	DISPLAY UNIT	NEC	LCD2010X	BECK, TERRENCE
2109186	DISK DRIVE UNIT	SILICON	FIRE10R	CANTER, GEORGE
2109187	DISK DRIVE UNIT	SILICON	FIRE10R	CANTER, GEORGE
2109350	DISPLAY UNIT	DIGITAL	VRC21-WA	CANTER, GEORGE
2109351	COMPUTER, MICRO	DIGITAL	PB550-A9	CANTER, GEORGE
2044839	OSCILLOSCOPE	TEKTRONIX	TDS3034	CHENG, EDWARD
1645363	COMPUTER DIVICE	PALM	PALMIIIC	GLASSER, KATHLEEN
2109352	COMPUTER, MICRO	DELL	4100	NOVELLO, JOSEPH
2109353	DISPLAY UNIT	DELL	M991	NOVELLO, JOSEPH
1946185	DISPLAY UNIT	GATEWAY	069CS	PAYNE, LESLIE
1815089	COMPUTER, MICRO	MICRON	2PP200MT	PAYNE, LESLIE

ECN	ITEM NAME	MANUF.	MODEL	USER NAME
1531381	PRINTER/LASER	DEC	LN14ACA	POLAND, ARTHUR
1756690	DISK DRIVE, OPTICAL	APS	DA050APS	GURMAN, JOSEPH
1528706	SERVER	DEC	470AP-A9	GURMAN, JOSEPH
1819850	DISPLAY UNIT	GTS	GDM-W900	GURMAN, JOSEPH
1949931	DISPLAY UNIT	SONY	90W01T5	GURMAN, JOSEPH
1418850	COMPUTER	DEC	PE54A-AA	GURMAN, JOSEPH
1415654	COMPUTER	DEC	PE32AA9	GURMAN, JOSEPH
2035938	PRINTER	TEKTRONIX	4685	GURMAN, JOSEPH
1104454	DISK DRIVE	SUN	411	BROSIUS, JEFFREY
G044535	DISK DRIVE	DEC	RRD40	GURMAN, JOSEPH
1415653	COMPUTER	DEC	PE32AA9	GURMAN, JOSEPH
1415661	DISPLAY UNIT	SONY	GDM2039	GURMAN, JOSEPH
1180910	COMPUTER, MICRO	OPTIMEM	48633	POLAND, ARTHUR
1334199	COMPUTER, MICRO	DEC	PE40ACR	GURMAN, JOSEPH
1415664	DISPLAY UNIT	SONY	GDM2039	GURMAN, JOSEPH
1180911	DISPLAY UNIT	KFC	CK1405	POLAND, ARTHUR
1192513	SERVER	DEC	SEACTAXB01	GURMAN, JOSEPH
1416588	COMPUTER	APPLE	M1688	GURMAN, JOSEPH
1418851	DISPLAY UNIT	DEC	VRC21-HA	GURMAN, JOSEPH
0097593	CONTROLLER, TAPE DRIVE	EXABYTE CORP	EXB8200	THOMPSON, WILLIAM
1183642	COMPUTER, MICRO	AST RESEARCH	386SX20	DESSELLE, NORMA
G035510	DISK DRIVE	TRUSTED	TS676150DT	BROSIUS, JEFFREY
1750800	DISPLAY UNIT	APPLE	M0401	POWERS, TIMOTHY
0098137	MONITOR	IBM	8512	PAYNE, LESLIE
0091000	TERMINAL	CORP	GO-235	HORN, MICHAEL
1333150	DISPLAY UNIT	SAMSUNG	CCB7571	HUMBERSON, DALE
1418763	DISPLAY UNIT	SONY	VRT19HA	HARZER, JON
1410720	TERMINAL, DATA PROCESS	HUMAN DESIGN	CT20D	THOMPSON, WILLIAM
1418514	DISPLAY UNIT	SONY	GDM20D11	AMATO, MICHAEL
1333941	TERMINAL, DATA PROCESS	NETWORK	190	WHITE, LARRY
1530721	DISPLAY UNIT	DEC	VRT19HA	CHENG, EDWARD
1107982	DISPLAY UNIT	VIEWSONICS	TX14H30PTK	SODROSKI, THOMAS
1529251	DISPLAY UNIT	DEC	VRC21-HA	HEAP, SARA
1750495	DISPLAY UNIT	SONY	GDM1950	POWERS, TIMOTHY
1411106	DISPLAY UNIT	CTX	CPS1760LR	
1107984	DISPLAY UNIT	VIEW SONIC	TX14H30PTK	
G041416	MONITOR	AST INC	NONE	HORN, MICHAEL
1094838	MONITOR	DIGITAL	VRT19DA	HEAP, SARA
1752836	DISPLAY UNIT	HITACHI	CM171MU513	SWEIGART, ALLEN
1190548	DISPLAY UNIT	NEC	JC1741VMA	HEAP, SARA
1192508	DISPLAY UNIT	SHAROCK	SRC1501	SWARTZ, MARVIN
1344678	DISPLAY UNIT	DEC	VRC21HA	BROWN, LARRY
1189711	DISPLAY UNIT	AST	66267	KRUEGER, VERNON
1529910	DISPLAY UNIT	DEC	VRC21-HA	HEAP, SARA
1413255	DISPLAY UNIT	SILICON	GDM20D11	DOUGLASS, DEBORAH
1187369	DISPLAY UNIT	ZEOS	CVP5468NI	HEAP, SARA
1523897	ALPHA SERVER 2100	DEC	47DAP	HORN, MICHAEL
1700664	COMPUTER, SERVER	DIGITAL	470AP-A9	HEAP, SARA
1529909	COMPUTER, MICRO	DEC	470APA9	HEAP, SARA
1413227	COMPUTER	APPLE	M4880	SONNEBORN, GEORGE
1340196	PRINTER	APPLE	M1446	SILVERBERG, ROBERT
1943610	TRANSPORT, MAG TAP	APS	HYPERDAT	GURMAN, JOSEPH
0828329	DISK DRIVE	SYSGEN INC	A/T	
1333802	DISK DRIVE UNIT	SUN	411	AMATO, DEBORAH
1343836	DISK DRIVE UNIT	SUN	411-X557A-ST	KENNY, PETER
2041244	COMPUTER, MICRO	MIDWEST	486DX33	BILODEAU, PAUL
1750492	COMPUTER, MICRO	APPLE	M5780	POWERS, TIMOTHY
1750493	COMPUTER, MICRO	APPLE	M5780	POWERS, TIMOTHY
0278517	COMPUTER PERSONAL	TELEVIDEO	286-PC	CRANNELL, CAROL

1415500	REPEATER, MULTICONNECT	3COM CROP	3C588	HARZER, JON
1182421	COMPUTER MICRO	TANGENT	486	HARZER, JON
0095819	EXPANSION BOX	EMULEX CORP	PE4016M	HORN, MICHAEL
1750496	COMPUTER, MICRO	APPLE	M5780	POWERS, TIMOTHY
1096080	DISK DRIVE	APPLE	M2700B	DWEK, ELI
1105676	COMPUTER, MICRO	APPLE	IISI	SILVERBERG, ROBERT
1331836	COMPUTER, MICRO	PEAK	63135GHP	HARZER, JON
1185510	DISK DRIVE UNIT	UNISON CORP	SC22080	SILVERSTEIN, MARK
1103680	DISK SUBSYSTEM	UNISON	159815	NEFF, SUSAN
G036121	DISK DRIVE	EXABYTE CORP	STSOTTI	HORN, MICHAEL
1093944	DISK DRIVE	TRUSTED	MT2F42DEC	HORN, MICHAEL
1415406	DISK DRIVE UNIT	MESA	6313	HARZER, JON
G041503	DISK DRIVE UNIT	THREE F	94601	HARZER, JON
G086608	DISK DRIVE	TRUSTED	NONE	SILVERBERG, ROBERT

GSFC ATR: Edward C. Sullivan
Raytheon ITSS Task Leader: George Canter

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

This task provides for timely repair of microcomputers, peripherals, and other workstations; support for selection, acquisition, and configuration, including software, of acquired computer hardware; maintenance, upgrade, and user support for applications software; backups and restorations of critical computer files; support for the LASP Local Area Network (LAN) including hardware installation and configuration, and operations improvements through usage, disk space, and performance analysis and implementation of systems tuning.

WORK ELEMENTS

100 Computer repair

Staff provided software support, hardware support and installation/setup on PC's, Macintosh's, notebook computers, workstations, network and associated peripherals. Corrective and preventive maintenance was performed on laser printers. PC computers and workstations were relocated to accommodate office reorganizations and the building renovations. As necessary, staff provided individual instructional training to the user community on operating systems and applications. Staff provided support to ODIN technician staff and end users of ODIN supported computers, as well as hardware and software support for ODIN computers.

Staff:

Repaired paper jam in HP 8100.
Reconfigured, set up and installed old computer system for K. Glasser.
Replaced toner cartridge in HP Laserjet II for A. Tempkin.
Replaced toner cartridge on Tektronix 560.
Replaced hard drive for D. Fixsen.
Replaced hard drive for K. Glasser.
Replaced toner cartridge in Tektronix 560 for R. Fisher.
Repaired power switch on HP Laser 4050, in group area.
Contacted Dell for Replacement CD ROM for new SUNBEAMS system; installed replacement once arrived.
Repaired and reconfigured computer system for T. Eskin.
Reconfigured and set-up new system for E. Sullivan.
Corrected SCSI problem with G. Voellmer notebook.
Corrected HP III printer fan and jamming problems for W. Feibelman.
Fixed J. Novello's HP III printer 50 fuser error.
Replaced SCSI disk in B. Muney's Sun workstation.
Corrected modem and terminal problem for A. Bhatia.

200 New acquisitions

New acquisitions and installations were supported. Staff:

Set-up and configured new server for LASP cluster.
Ordered new software for C. Crannell.
Assisted with UPS battery replacements.
Installed and configured new desktop system for computer; system provided by SUNBEAMS Program.
Processed and returned three software purchases to Amazon.Com for J. Novello and C. Crannell.

Ordered WordPerfect 2000 for C. Crannell.
Installed and configured new monitor for C. Baxley.
Installed and configured new monitor for C. Johnson.
Installed and configured new system for J. Novello.
Installed and configured new computer system for C. Johnson.
Installed and configured computer system for J. Stewart, per request of J. Novello.
Installed new memory for P. Kenny.
Installed new Tektronix 560 printer for R. Fisher.
Processed order for new lower tray assembly for Tektronix 560 printer for R. Fisher.
Installed and setup Power Mac G4 for T. Eskin.
Installed MS Project for J. Novello.
Removed usable computer cards from old system from SUNBEAMS, and processed equipment to be excessed.
Installed and Configured MS FrontPage for E. Sullivan.
Installed and configured new system for SUNBEAMS.
Reconfigured old system and set-up for SUNBEAMS.
Installed and configured new system for C. Crannell.
Researched and procured new laptop for T. Stecher.
Ordered Windows 2000 and Office 2000 for T. Eskin's computer.
Installed 40gb DAT tape drive, Adaptec SCSI card and software on K. Long's PC.
Upgraded M. Swartz's PC and software from a 486 to a Pentium.

300 Software support

Software support activities included:

Removed virus from C. Crannell's computer system.
Removed virus from K. Glasser's computer system.
Started new phase of Laboratory computer software upgrades.
Assisted K. Glasser with reading and printing image files from zip disks.
Fixed software error for D. Unkle in Eudora.
Fixed corrupt profile for S. Wright.
Fixed Eudora settings for C. Johnson.
Upgraded software for T. Stecher's laptop.
Repaired communication errors with T. Stecher's laptop.
Configured access for C. Baxley, J. Lofton, and C. Johnson on HP 8100 in Computer Lab, per their request.
Installed MS Office 2000 on E. Sullivan's PC.
Assisted C. Johnson with Netscape bookmark error.
Repaired E-mail server error on STARS.
Assisted J. Novello with restoring lost bookmarks.
Researched potential meeting software for E. Cheng.
Assisted K. Glasser with Netscape errors.
Assisted C. Johnson with Real Player errors.
Fixed error with Adobe Acrobat for K. Glasser.
Configured K. Glasser's Laptop for lab network and installed network printers.
Assisted D. Rabin with E-mail errors.
Set up new accounts for interns on systems for S. Brown.
Assisted L. White with MS Photo Editor.
Assisted J. Stewart with E-mail errors.
Researched existing application software for new system for E. Sullivan.
Repaired error in local profile for D. Appleman.
Instructed L. White on MS backup procedure.
Upgraded Veritas Backup Exec network backup software.
Upgraded VirusScan on A. Poland notebook and desktop.
Corrected R. Fisher's E-mail and hang problems on his notebook.

400 Backups

Assisted T. Beck with ACS version of back-up software for E. Cheng's group.

500 Local Area Network (LAN) support

Network connectivity was maintained for the computing and printing equipment in the lab.
Significant numbers of network connectivity moves, caused by building renovations, were supported.
New domain accounts were established for additional users as required for access to the LASP domain.

600 Operational Improvement

Staff assisted in the upgrade of four network closets, from mostly 10 megabit connections to 10/100 megabit connections.

700 ODIN Outsourcing Desktop Initiative for NASA

Installed and configured new Refresh System Seat for C. Johnson.
Installed and configured new Refresh System Seat for R. Oliversen.
Coordinated installation date for Office 2000 upgrade for ODIN seats.
Installed new monitor upgrade for C. Baxley.
Contacted ODIN for system retrieval for L. Payne's ODIN seat.
Processed and approved new ODIN NAD seat for W. Danchi in the ODO Database.
Processed and approved new ODIN NAD seat for N. Roman in the ODO Database.
Processed and approved two ODIN seat upgrades for R. Oliversen in the ODO Database.

Non-Local Travel

None

METRIC EVENTS

101   **Average problem diagnosis time (to be less than 8 hours during working hours)**

Average problem diagnosis time for all problems: 1.8 hours

Average down time per problem (to be less than 3 days)

Average down time for all problems: 3.6 hours

Month	#Problems	Average diagnosis time (hrs)	Average repair time (hrs)
March	6	0.7	1.5
April	4	1.0	1.3
May	4	3.9	7.9
June	2	2.5	6.5
Mar.-Jun.	16	2.0	4.3

Comments: The averages for diagnosis time and downtime have been significantly bettered.

Monthly Summary Report – March 2001

Problem	Call Date/Time	Diagnosis	Diagnosis Date/Time	Resolution	Completion Date/Time
Paper Jam HP8100	03/01/01 08:30 AM	Paper Jam in printer	03/01/01 08:45 AM	Removed paper; cleaned printer and tested	03/01/01 09:10 AM
		.15 Hours		.4 Hours	
Printer won't print	03/02/01 10:00 AM	Toner Cartridge is out	03/02/01 10:10 AM	Replaced Toner	03/02/01 10:15 PM
		0.10 Hour		0.3 Hours	
Notebook SCSI PC card failed	03/02/01 09:00 AM	Failed SCSI connector in ext. ROM drive	03/02/01 11:00 AM	Repaired internal SCSI connector	03/02/01 11:30 AM
		2.0 Hours		2.5 Hours	
HP III fan noise	03/12/01 11:00 AM	Bad fan motor blower bearings	03/12/01 11:30AM	Replaced fan	03/12/01 01:00 PM
		0.5 Hour		2.0 Hours	
Tek printer will not print	03/12/01 02:00 PM	Cyan toner cartridge was out	03/12/01 02:15 PM	Replaced toner cartridge	03/012/01 02:20 PM
		0.15 Hour		0.3 Hour	
Sun workstation disk errors	03/19/01 03:00 PM	Failed SCSI disk drive	03/19/01 04:00 PM	Replaced SCSI disk drive	03/20/01 10:00 PM
		1.0 Hour		3.0 Hours	

Monthly Summary Report – April 2001

Problem	Call Date/Time	Diagnosis	Diagnosis Date/Time	Resolution	Completion Date/Time
Printer will not print	04/18/01 9:30 AM	Black toner cartridge out	04/18/01 9:40 AM	Replaced black toner cartridge	04/18/01 10:00 AM
		.15 Hour		.30 Hours	
Printer keeps jamming	04/19/01 8:30 AM	Important switch within printer was broken	04/19/01 10:00 AM	Repaired switch	04/19/01 11:00 AM
		1.5 Hours		1.0 Hour	
CD ROM does not work on system	04/24/01 12:00 PM	CD ROM is broken	04/24/01 12:30 PM	System under warranty, ordered and installed replacement	04/26/01 10:30 AM
		0.50 Hour		6 Hour	
Sun workstation rebooting	04/26/01 01:00 PM	Problem with UPS	4/26/01 03:00 PM	Remove UPS until replacement received	4/26/01 03:30 PM
		2.0 Hours		0.5 Hour	

Monthly Summary Report – May 2001

Problem	Call Date/Time	Diagnosis	Diagnosis Date/Time	Resolution	Completion Date/Time
Printer is printing blank pages	05/02/01 1:30 PM	Toner cartridge needs to be replaced	05/07/01 1:45 PM	Replaced toner cartridge	02/07/01 2:00 PM
		0.15 hours		.5 hours	
Home CRT and modem fails	05/30/01 9:00 AM	1200 baud modem failed	05/30/01 1:00 PM	Replaced modem and setup	05/30/01 3:30 PM
		4.0 Hours		6.5 Hours	
PC noisy	05/28/01 10:30 AM	Failed fan bearings	05/29/01 08:00 AM	Replaced fan under warranty	5/30/01 11:00 AM
		5.5 Hours		16.5 Hours	
PC won't boot	05/17/01 10:00 AM	Failed power connector	05/17/01 04:00 PM	Used other power connector	05/17/01 06:00 PM
		6.0 Hours		8.0 Hours	

Monthly Summary Report – June 2001

Problem	Call Date/Time	Diagnosis	Diagnosis Date/Time	Resolution	Completion Date/Time
Network equipment rebooting	06/7/01 8:30 AM	Check SNMP on network equipment	06/7/01 11:00 AM	Moved equipment to other UPS	07/08/01 10:00 AM
		2.5 Hours		9.5 Hours	
HP4050 jamming	06/18/01 08:00 AM	Error 13.1	06/18/01 10:30 AM	Cleaned input rollers	06/18/01 11:30 AM
		2.5 Hours		3.5 Hours	

301   List of PC software packages currently supported

MS-DOS 6.22, MS-Windows 3.1, MS-Windows 3.11, MS-Windows 95, MS-Windows 98, MS-NT 4.0, MS-Windows 2000, MS-Resource Kit, MS-TechNet, MS Office 97, MS Office 2000, Exceed, OnNet, McAfee Virus Detection, Veritas Backup Exec, HP JetAdmin, ASAP, Adobe, Adaptec EZ CD Creator, Dantz Retrospect, Eudora, FlexLM, Clear Vision, VncViewer, Diskeeper and miscellaneous peripheral diagnostics

401   Backups

Month	PC Backups	Macintosh Backups
March	172	208
April	189	234
May	172	224
June	129	120
Summary:		
Mar.- Jun.	662	786

For purposes of backups, Laboratory PCs have been divided into two groups as follows.

Group 1	Volumes	**Group 2**	Volumes
		c6832h	1
c680e	1	daisy	1
c680s	1	endar	2
c681s	1	kosh	2
c682s	1	lasp-public	2
chrissy	2	newark	1
c685s	1	smokey	2
lasp-nts1	4	struthers	2
norton	2	jet1	1
ufos	1	c684n	1
c680m	1	fisher1	1
OSP3	2	poseidon	2
grichard	2	koronapc	2
birk	2	lasp-public2	2
Total —>	21	**Total —>**	22

DATE	JOB NAME	METHOD	Vol.	DATE	JOB NAME	METHOD	Vol.
PC Backup Log for March 2001 (total 172)							
3/05/2001	Group 1	Full	21	3/06/2001	Group 2	Full	22
3/12/2001	Group 1	Incremental	21	3/13/2001	Group 2	Incremental	22
3/19/2001	Group 1	Incremental	21	3/20/2001	Group 2	Incremental	22
3/26/2001	Group 1	Incremental	21	3/27/2001	Group 2	Incremental	22
PC Backup Log for April 2001 (total 189)							
4/02/2001	Group 1	Full	21	4/03/2001	Group 2	Full	22
4/09/2001	Group 1	Incremental	21	4/10/2001	Group 2	Incremental	22
4/16/2001	Group 1	Incremental	21	4/17/2001	Group 2	Incremental	22
4/23/2001	Group 1	Incremental	21	4/24/2001	Group 2	Incremental	22
4/30/2001	Group 1	Incremental	21				
PC Backup Log for May 2001 (total 172)							
				5/01/2001	Group 2	Full	22
5/07/2001	Group 1	Full	21	5/08/2001	Group 2	Incremental	22
5/14/2001	Group 1	Incremental	21	5/15/2001	Group 2	Incremental	22
5/21/2001	Group 1	Incremental	21	5/22/2001	Group 2	Incremental	22
5/29/2001	Group 1	Incremental	21	5/30/2001	Group 2	Incremental	22
PC Backup Log for June 2001 (total 129)							
6/04/2001	Group 1	full	21	6/05/2001	Group 2	full	22
6/11/2001	Group 1	incremental	21	6/12/2001	Group 2	incremental	22
6/18/2001	Group 1	incremental	21	6/19/2001	Group 2	incremental	22

Laboratory Macintosh computers are backed up as a single group, as follows:

Macintosh Backup Log 2000 AND 2001

JOB NAME	Volumes		DATE	JOB NAME	METHOD	Vol.
Iasp pubic	1		**Mac Backup for March 2001 (total 208)**			
Eldar G28	1		03/05/01	same group	full	26
Eli Dwek's	4		03/08/01	same group	incremental	26
Harvey G3	6		03/12/01	same group	incremental	26
Mather's G3	1		03/15/01	same group	incremental	26
Dale Mac	2		03/19/01	same group	incremental	26
Eli Dwek's G-3	1		03/22/01	same group	incremental	26
Asterix	5		03/26/01	same group	incremental	26
Safire	3		03/29/01	same group	incremental	26
Total Volumes	**24**					

DATE	JOB NAME	METHOD	Vol.	DATE	JOB NAME	METHOD	Vol.
Mac Backups for April 2001 (total 234)				**Mac Backups for May 2001 (total 224)**			
04/02/01	same group	full	26	05/03/01	same group	full	26
04/05/01	same group	incremental	26	05/07/01	same group	incremental	26
04/09/01	same group	incremental	26	05/10/01	same group	incremental	26
04/12/01	same group	incremental	26	05/14/01	same group	incremental	26
04/16/01	same group	incremental	26	05/17/01	same group	incremental	24
04/19/01	same group	incremental	26	05/21/01	same group	incremental	24
04/23/01	same group	incremental	26	05/24/01	same group	incremental	24
04/26/01	same group	incremental	26	05/29/01	same group	incremental	24
04/30/01	same group	incremental	26	05/31/01	same group	incremental	24

DATE	JOB NAME	METHOD	Vol.
Mac Backups for June 2001 (total 120)			
06/04/01	same group	full	24
06/07/01	same group	incremental	24
06/11/01	same group	incremental	24
06/14/01	same group	incremental	24
06/18/01	same group	incremental	24

GSFC ATR: Dr. Gary F. Hinshaw
Raytheon ITSS Task Leader: Michael R. Greason

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The objectives of this task are to provide scientific programming support for the Microwave Anisotropy Probe (MAP).

WORK ELEMENTS

100 Algorithm development

Analysis of the utility of the absolute calibration factor in cal_map continues; the mathematical analysis has been made available on the web; accompanying data analysis has begun.

200 Software development

Analysis of the results of C0 pass of cal_map and iterate_map was performed and written up in HTML format. Plots of the calibration and images of the skymaps were produced and made available on the web.

Many of the software related web pages on the Science Team web site were updated to reflect the current state of the data analysis software. Pages were reformatted to give them all a similar structure. A Power Point chart showing the origin of the 25.6ms delay in science packet time was created and made available on the web site. The time description was updated to include a definition of UTCF and how it is implemented.

The IDL software used to create web-based telemetry plots was changed to allow an exponential fit to be superimposed over the data plot. Multiple mnemonics may now be plotted on a single axis (as originally written) or on individual plots. Modifications were also made to allow access to some pseudo-telemetry mnemonics.

The spacecraft trending pages have reached maturity. There are now a total of 18 pages, providing trends for the deployables, power, communications, propulsion, attitude, C&DH and thermal subsystems.

Spacecraft data tracking software was made more robust in the case of completely missing packet apids. A spacecraft page generation option was added to emi_data_tracker, and data tracking based on file names rather than times was made possible for simulations when the computer system clock doesn't agree with the spacecraft clock.

Simulated spacecraft trajectory locations were provided for a 3-d graphics animation.

Software to run a dipole calibration directly from telemetry files was developed in IDL. Expected temperature differences for each DA are computed from the spacecraft attitude and the antenna orientations, given the combined COBE dipole and spacecraft heliocentric velocity dipole. The software has been tested against iteration 1 of the simulation C0 cal_map output. As part of this effort, IDL routines were written to access a FITS binary table version of the JPL ephemeris, which is distributed by HEASARC. Also, a few pre-existing routines were optimized for speed using the output of the IDLDE code profiler for guidance.

The C1 pass of the pipeline software was planned and modifications of the software have begun.

The spacecraft housekeeping simulation program (SIM_SCHK) was modified for Pass C1. The modifications include a new spacecraft ephemeris, lunar and solar positions, non-observing modes and non-constant values for the UTCF and leap seconds. Two years of simulated data were created.

The Telemsort program was modified to update an index of telemetry files; a module to maintain such an index in Fortran was written. A problem in the UTCF Fortran module was detected and corrected in the course of modifying Telemsort.

The dircomp.pl Perl script (a script to identify files that have changed between two directories) was updated to use Telemsort to actually copy files as well as identify those files that need copying. This script forms the basis for an automated LZP data copier that has also been implemented.

Cal_Map was modified to write its calibration files as binary FITS files; the corresponding Fortran and IDL calibration reader and writer routines were modified to accommodate this change. An additional binary FITS file is also written containing a subset of the telemetry corresponding to the calibration sequences in the calibration files. Software was pruned from Cal_Map that: 1) set up spline fitting of the calibration data (this is now done in the archive updater), and 2) reads and writes absolute calibration factor files (these factors are now stored in the calibration file FITS header).

The preprocessor was modified to obtain the MAP position and velocity from an ephemeris packet in the spacecraft telemetry data file. The position and velocity are interpolated from the data in the packet; a bicubic spline algorithm was adapted to perform this interpolation.

Development was begun of a moon signal simulator to probe the far sidelobes of the antenna patterns during the phasing loops. The simulation is based on two inputs: (1) the COBE/DMR observations discussed in Bennett et al. (1992, *ApJ*, 391, 466), and (2) the simulated sidelobe maps computed at Princeton. The Princeton maps were downloaded and converted to FITS format. The algorithm was prototyped in IDL to get the flux scaling right and check the coordinate system transformation, since the Princeton maps are centered on the average boresight axis. To aid in this effort, two IDL GUI display widgets were written. HEALSHOW splashes a HealPix map over a sphere that can be rotated using the mouse. MAPEPVIEW plays back ephemeris and quaternion files to show the sky from the point of view of the spacecraft as a function of time. HEALSHOW is delivered, but MAPEPVIEW is still being enhanced. The Moon signal algorithm has been implemented as a Fortran 90 module suitable for inclusion in the science data simulator. The Fortran and IDL results have been cross-checked and have only slight roundoff differences.

Rudimentary usage documentation for all the pipeline Fortran programs was written and put on the science team web site. A set of flowcharts showing how these programs interrelate was written and is used to navigate to the individual program documentation.

300 Science data analysis

400 MAP Project Office software support

Routine system administration such as client configurations and backups was performed.

Staff:
-provided user support on client Meeting Maker.

-configured many PCs and notebooks for network connectivity and printer queues at GSFC and Kennedy Space Center (KSC).

-restored data for G. Davis on his Mac.

-assisted in moving the MAP science team out of B29/R250 after MAP was shipped to KSC.

500 Flight software group support

600 Integration and Testing support

The mini-OMEGA concept was developed and implemented. In the SMOC, an existing SUN Ultra 60 workstation is being used to generate near-realtime trending plots. OMEGA nodes HZ and CEYLON were configured to work together as a single mini-OMEGA system and have been shipped to KSC for use by personnel there.

Trending was supported during TV/TB, and continues for mission simulations.

Thermal fits of MAP spacecraft sensors were performed for data taken during the hot balance test. These fits were provided to D. Powers.

Calibration data was screened for quality as input to G. Hinshaw's offset model.

700 MAP scientific computer and facilities support

Staff performed routine system administration and backups on the Omega Unix and MS Windows computer systems.

Routine administration of hardware and software maintenance contracts continued.

Additional disks for the Origin 2000 arrived and were installed. The /map/data filesystem was cleaned up in preparation for this installation. The disks have been integrated into the /map/data filesystem.

Portsentry was installed on Omega and CMB to monitor attack scans.

The latest version of CMBFAST was downloaded and installed.

Additional computer equipment for the Omega was researched and has been ordered. This equipment includes: a small Beowulf cluster computer, three workstation PCs, a computer projector, and two Macintoshs. Assorted necessary software was also ordered.

Two 34GB disks were installed on the Sun Ultra 60 acting as the SMOC mini-Omega. Solaris 8 was installed on this system.

Staff resolved an intermittent data structure error to a bad memory DIMM and replaced it under warranty in a GSE workstation.

Staff:
-installed a new 18gb SCSI drive in a GSE workstation for D. Fink's PC.

-installed a CD-RW in a GSE workstation to be used for backups.

-installed 30gb IDE disk drives in 2 GSE workstations for archiving, and set up scripts to automate backups.

-replaced a failed system drive with a 36gb SCSI drive and installed OS in one of the GSE workstations.

-installed ends on a new cat5 run and certified the cable.

-acquired and installed an internal IDE CD-RW in C. Bennett's PC, and updated Office 97 to Office 2000 on his PC and notebook.

-upgraded five PCs video cards to support true color at higher resolutions.

-set up the new FAX machine and one of the new PCs.

Problem Areas

None

Non-Local Travel

Staff traveled to Kennedy Space Center in April to set up the mini-Omega systems and to help with other GSE setups there. A second trip to KSC was made in April to set up additional GSE, and a third was made in June to update software on and diagnose problems with the mini-Omega systems. Another trip will be made at the end of June or early July to support the MAP launch.

METRIC EVENTS

101   **Develop a moon signal simulator**
      Completion date: June 30, 2001

      Percent complete: 90%

      Comments: Date changed with ATR concurrence.

102   **Galactic signal analysis by correlation studies**
      Completion date: August 31, 2001

      Percent complete: 0%

      Comments:

103   **Analyze the utility of the absolute calibration factor in the data calibration software**
      Completion date: March 21, 2001

      Percent complete: 100%

      Comments:

104   **Dipole calibration from raw data**
      Completion date: May 31, 2001

      Percent complete: 100%

      Comments:

206   **Develop a phasing loop simulation to determine moon visibility**
      Completion date: March 31, 2001

      Percent complete: 100%

      Comments: Date changed with ATR concurrence

207   **Port the Princeton power spectrum software to Omega**
      Completion date: July 31, 2001

      Percent complete: 0%

      Comments: Date changed with ATR concurrence; this software has not been delivered by Princeton.

208   Complete the C1 pass modifications to the pipeline software
        Completion date: July 15, 2001

        Percent complete: 25%

        Comments:

601   Perform analysis of the observatory test data
        Completion date: April 15, 2001

        Percent complete: 100%

        Comments: Date changed with ATR concurrence

602   Support Cape and Mission operations as required
        Completion date: N/A

603   Develop web-based trending and analysis plots of spacecraft telemetry
        Completion date: June 30, 2001

        Percent complete: 100%

        Comments:

GSFC ATR: Dr. Eric P. Smith
Raytheon ITSS Task Leader: Michael Greason

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The objectives of this task are to provide computing and World Wide Web (WWW) support for the Next Generation Space Telescope (NGST) project.

WORK ELEMENTS

100 Hardware selection, procurement, installation, and network integration

200 Software installation

A new version of the Verity search engine, spider, agent server, etc. was installed. This software is now called Portal One.

300 Backups

Routine backups were performed.

400 Maintenance of the WWW site

Routine system administration and security monitoring were performed.

Routine account maintenance was performed.

The transition from the NGST Meeting Maker server to the center-wide Meeting Maker server was supported. Task personnel provided the ODIN staff with the Meeting Maker server databases and contact information for all NGST Meeting Maker users. Task personnel also attended weekly meetings to prepare for the transition. The first attempt at the transition failed, requiring task personnel to re-initialize the NGST Meeting Maker server and also perform a large amount of user interface to correct the ensuing problems. Task personnel acted as liason between the NGST project, Meeting Maker tech support and the ODIN staff to ensure a more successful second attempt. The second attempted transition succeeded.

500 WWW site software enhancements and feature development

A memory leak in the PICS software was detected and corrected.

A database error in the PICS software was detected and corrected.

600 NGST document management system development

Non-Local Travel

None

METRIC EVENTS

101   Maintain monthly system uptime statistics

Server/system availability:

	Public Web Server	Private Web Server	System
March	100%	100%	100%
April	82.1%	82.1%	82.1%
May	90.9%	90.9%	90.9%

Comments: Statistics reporting runs one month behind because the bookkeeping software can only be run after the reported month. The April and May downtime was due to scheduled power outages in Building 21.

**201   Install the Verity Portal One upgrade
Completion date: May 31, 2001**

Percent complete: 100%

Comments:

501   Perform bug fixes and feature updates on PICS 2.0

List of fixes and updates:
- A memory leak in the document search system was detected and corrected.
- Document revision lists in the document descriptor display page were put into a select widget to control the size of the page.

GSFC ATR: Dr. John C. Mather
Raytheon ITSS Task Leader: Joel Offenberg

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The objectives of this task are to develop, implement, and evaluate algorithms for on-board processing of NGST real-time data.

WORK ELEMENTS

100 Collection of current signal processing programs, theoretical performance, and computational resource requirements (tech report)

200 Emulation of scientific data, analysis, and performance

Staff has begun an analysis of alternative methods for processing uniformly-sampled data. This study is being undertaken at the request of the NGST science team; the concern on the part of the NGST team is that any on-board computer system will not have sufficient memory and buffering space to hold more than a fraction of the data at any one time. We have compared several approaches and are preparing a formal analysis to be distributed to the NGST team.

300 Prototype signal processing code

400 Parametric studies (technical reports, white papers, scientific workshop part of NGST SWG effort)

Staff is assisting the NGST Radiation Effects study team at GSFC. Staff participated in regular NGST project "micro-glitch" meetings. The team is studying radiation effects on the NGST detectors and is concentrating on the "micro-glitch" effects seen in ISOCAM, which was attributed to a large number of low-charge events which created numerous small "glitches" in the ISOCAM data. These micro-glitches represent a particularly pernicious problem because they are not easily separable from the inherent detector noise, and there are so many of them that they can affect the noise measurements. The origin of the micro-glitches and possible mitigation techniques are being studied by this team. Part of the test plan is to take NGST-candidate detector technologies to a radiation facility (e.g. a particle accelerator) and bombard the detectors with energetic particles. Staff will participate in collecting the data and helping to analyze it. Staff participated in the analysis of several early rounds of radiation testing with the Radiation Effects Analysis Group (REAG).

Non-Local Travel

Task personnel traveled to the American Astronomical Society meeting, Pasadena, CA.

METRIC EVENTS

301   **Provide final delivery of software for use on REE testbed computer. Assist REE team in implementation and use of software and interpretation of results.**
Completion date: TBD per REE team schedule

Percent complete:

Comments: Not yet requested by REE team.

401   **Prepare and deliver study summary to NGST project science, detector and software teams**
Completion date: August 31, 2001

Percent complete: 70%

Comments: Papers (A) and (D), being prepared for metric 401, above, have been circulated to the project and will be included in the final summary. An analysis of alternative processing approaches is being prepared for inclusion in the final summary as well.

402   **Participate in analysis of NGST detector test data**
Completion date: TBD per program team requirements

Percent complete: N/A

Comments: Participated in meetings and discussions with NGST Radiation Effects and Analysis Group regarding radiation testing and validation for NGST-type detectors. Made recommendations regarding the type and focus of radiation testing. Participated in analysis of radiation test data.

403   **Provide reports to NGST project team as needed with respect to trade studies, detector modeling and data handling methods**
Completion dates: TBD per program team requirements

Percent complete: N/A

Comments: Discussed plan for implementing laboratory cosmic-ray tests with IR-testbed development leads. Delivered information relevant to NGST detector development proposal teams. Provided guidance and documentation to the NEXUS team (an NGST technology testbed mission) regarding the cosmic ray software. Participating in bi-weekly NGST project "micro-glitch" teleconferences and radiation effects studies. Preparing analysis of alternative processing approaches as requested by team scientists.

404   **Provide status reports (monthly) and technical reports on task elements 100, 200 and 300 in accord with milestone schedule above**

Percent complete: 100%

Comments: Reports delivered monthly.

NASA Task: 97S0016   STIS Science Support

GSFC ATR: Dr. Sara R. Heap
Raytheon ITSS Task Leader: Robert S. Hill

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The objective of this task is to assist in Space Telescope Imaging Spectrograph (STIS) science by support of the Guaranteed Time Observers in the areas of scientific software, secretarial and administrative services, ancillary databases, parallel observations, public outreach, training, and data analysis.

WORK ELEMENTS

100 STIS calibration support

110 Pre-launch calibration

120 Post-launch calibration

Staff attended the April 5th ST ScI STIS calibration meeting.

Staff created and inspected the weekly CCD superdarks, biases, and hot pixel tables. Special processing was required for the week of March 1-8: HST was in safe mode March 5-7 and no darks or biases were available. Because of virtual memory problems with the machine Colossus, the software for creating superbiases was modified so that no more than 50 images are required to be in memory at the same time. The binned biases were obtained from STScI. Due to the STIS safing on May 5, 2001, a special set of darks and biases had to be created for the last week of STIS observations.

Staff completed two analysis memos, which are included on the STIS IDT Web site as postlaunch memos 64 and 65. Memo 65 describes the outcome of the spectroscopic STIS/CCD ghost observation (program 8852), and memo 64 describes the computation of charge-transfer inefficiency (CTI) using hot pixels as the source of electrons. The CTI measured by this method shows apparent fluctuations not seen in other, more conventional CTI measurements.

Staff continued work on fitting the fringing data using the Fresnel equation model of the STIS fringing behavior. The first 320 rows of the upper half of the CCD have now been fitted, in addition to the bottom half. Pixel by pixel fitting continues.

Staff developed an animated visualization of traveling waves in the top layer of the STIS/CCD for help in writing up the fringing paper.

Staff installed 78 calibration reference files, as detailed in the monthly Product Reports.

200 Administrative support

Staff created the agenda page and address list for the Hven conference publication.

The STIS activity database and the GTO observation database were updated and circulated. RPS2 Phase II submissions for Cycle 9 target observations were tracked, and discrepancies between planned and actual orbit allocations were investigated and corrected.

Staff continued to monitor the application and badge procedures for a non-citizen applying for a long-term work assignment in the LASP. The application procedures were facilitated for five non-citizens applying for separate visits to Goddard.

Minutes were taken and distributed on 10 weekly analysis meetings.

The HST daily reports, the STIS and WF analysis and shift reports, STIS weekly analysis meeting summaries, and the STIS schedules and general memos were added to a back-up database.

300 Developing reference astronomical databases

The HST_CATALOG database was updated to contain entries through 1 March 2001.

400 Developing scientific software for analysis of STIS data

Staff continued the evaluation of IDL object graphics for use in analysis of multi-dimensional data.

The FUSE routine LINE_NORM was modified to work properly with STIS echelle data where all of the spectral orders have been spliced into one long spectrum.

Staff summarized STIS/CCD ghost geometry results in a calibration reference file which was submitted for installation. A program STIS_GHOST was written to plot predicted ghost positions on displayed images when the position of a source is indicated with a mouse click. A one-page user's guide with examples was distributed to the STIS team.

Two additions were made to the true color composition tool TCTOOL. This tool allows the user to stack 3 images, one in each of the red, green and blue planes, and view the result on the screen (in 24 bit mode). The tool then lets the user create a postscript file of what is seen on the screen. The new features allow the user to annotate the image with text and arrows (eg. point out the candidate star) and to use the IDL astro library routine ARROWS to put North and East arrows on the image. The user can annotate the image with as much text and arrows as he/she pleases, but only one set of N-E arrows is allowed. The tool will recreate all of the annotations in a postscript output using vector graphics (not bit maps).

Coding was done for routine ECHELLE_NORM, which performs continuum fitting to STIS echelle spectra. It calls C program continKP3 developed by Romeel Dave' (University of Arizona) which is used to automatically fit a continuum spectrum to each spectral order. ECHELLE_NORM then displays the results and allows the user to interactively delete regions from the continuum fitting process or allows the user to manually define the continuum level with a cubic spline through user defined node positions.

Fortran and IDL driver routines called EW_FIND were written to run a subroutine of the autoVP package developed by R. Dave'. EW_FIND automatically finds spectral features in a normalized spectrum.

Staff installed 51 software updates, as detailed in the monthly Product Reports.

500 Investigating the properties of the HST/STIS point-spread function

600 STIS IDT Information management

610 World Wide Web (WWW) Site

Staff continued updates and additions to the following portions of the STIS team web page: (1) archive of the GSFC local STIS analysis meeting minutes (http://hires.gsfc.nasa.gov/stis/postcal/ meetings/ minutes.html); (2) updates of the GTO Proposal Status; (3) updates to the scheduled STIS activities (summaries, detailed and review timelines).

620 Science Data

Staff archived data for STISLOG entries 61915-68002 (15 Feb - 31 May 2001). A complete list is at http://hires.gsfc.nasa.gov/stis/science/data/data.html.

Staff also acquired WFLOG entries 13518-14729.

To monitor upcoming STIS activities, 31 SMS files were processed.

700 Assisting in public Information programs

Staff continued to get HST Press Releases and update the notebooks.

800 Assisting with STIS GTO and parallel programs

Staff worked with S. Heap and C. Grady to plan follow-up coronographic spectroscopy of the companion to HD36112. Using experience in trying to deal with the coronographic spectroscopy of TW Hya and HR4796A, staff concluded that it is better to put the primary star of the fiducials of the slit on rather than off the slit. The approach has been used for the HD36112 observations. An RPS2 file was hand tooled for this 2 orbit program.

Staff wrote an IDL widget similar to slwidget, but which allows the user to "leaf" through the parallels and extract spectra quicker. The tool does a comparison of the extracted spectra to the Pickles spectral library augmented with L-type dwarf spectra from Reid. A button to launch the single image cosmic-ray cleaning tool CLEAN1 is now included. This allows the user to assign spectral types efficiently. A button to launch the defringing tool is included.

The STISPAR database was updated with annotations of emission line galaxies. A list was produced of ~300 fields with spectral exposure time greater that 3000 seconds and galactic latitude > 30 or < -30 which will be used as the basis for an emission line galaxy number counts paper. Approximately 20% of the fields contain an emission galaxy.

The effects of slitless spectrum distortion were reviewed for the STIS parallels. The distortion is not characterized for sources that do not fall on the central column of detector.

Staff obtained WFPC2 photometry of the core of NGC 2808 from M. Zoccali (Padova) and created an IDL database. This photometry will be cross-correlated with the STIS ultraviolet photometry. Staff also edited and commented on the draft of the paper "Understanding Horizontal Branch Anomalies in NGC 2808" by T. Brown (NOAO) et al.

The reduction procedure used for the spectra of white dwarf G191B2B was further documented. New fits were computed for the Lyα spectrum of this star using the latest photospheric models computed by I. Hubeny. The seven E140M data spectra were reduced and coadded, and consistency was found with the E140H results. A poster was prepared on G191B2B results for the conference "Deuterium in the Universe" in Paris 25-27 June 2001. A grid of ten NLTE model atmospheres was used to determine how the uncertainty of the underlying continuum propagates to an uncertainty in the derived D/H abundance. Both interstellar components toward G191B2B are consistent with a value of D/H = 1.54 +/- 0.08.

An IDL script was written to generate a synthetic spectrum from a CLOUDY output line list. This is useful for comparison with the observed emission line spectrum of Weigelt blobs B&D in η Carinae.

Staff began writing an IDL routine that automatically detects emission lines in STIS parallel extracted spectra in order to help determine the completeness of the sample.

Staff began reprocessing STIS parallels. The major updates to the reduction procedure are a new method of creating bias frames (implemented in the summer of 2000) and a correction to the dark subtraction for the 1x2 binned slitless spectra. 1824 of 2473 fields have been reprocessed.

Sensitivity calibration data for the G750L, 8975A central wavelength setting were compared with those for the 7751A setting. Staff concluded that the curve for the 7751A setting could be used for the 8975A setting. The 8975A setting gives no useful sensitivity information because it suffers from second order contamination beyond 10000A.

Examination of the STIS parallels for low mass stars continued. So far ~300 candidate M stars have been found at galactic latitudes above +20 deg and below -20 deg. Of these 260 have been examined in greater detail. About 240 of them have been confirmed as M type stars (nearly all are dwarf stars). Of the remaining stars 12 are likely to also be M stars, but are too faint to be certain.

The WFPC2 Francis cluster F410M and F450W images and color-magnitude diagram are being examined to see if more Lyman-α emitting galaxies can be found at z=2.38.

Staff obtained ISOCAM, WFPC2, and NIC data corresponding to far-UV STIS observations of 5 more IR-bright star forming galaxies (SNAP proposal 8721). There have been 21 galaxies observed in this program.

900 Training and assisting users

Assistance was provided to:

S. Heap in constructing a realistic simulation of STIS echelle observations of 3c273 from model data.

T. Gull in the preparation of the η Car Conference Proceedings for the ASP.

Non-Local Travel

Staff traveled to the conference "Deuterium in the Universe" in Paris 25-27 June 2001, presenting a poster.

METRIC EVENTS

101   Monthly: List new and modified calibration files

Completed as required. Delivered as part of the STIS task monthly report.

201   Weekly: Write and circulate technical minutes of the analysis status meeting

Completed as required. Circulated by E-mail weekly.

301   Monthly: List new and modified reference astronomical databases

Completed as required. Delivered as part of the STIS task monthly report.

401   Monthly: List new and modified scientific software for analysis of STIS data

Completed as required. Delivered as part of the STIS task monthly report.

601   Monthly: List Web site additions and enhancements

Completed as required. Delivered as part of the STIS task monthly report.

602   Monthly: List additions to STIS, NICMOS, and WFPC2 data archives

Completed as required. Delivered as part of the STIS task monthly report.

801   TBD dates: Support Cycle 8 and Cycle 9 proposal submission

Support was provided for tracking of Cycle 9 submissions as required.

GSFC ATR: Dr. Theodore R. Gull
Raytheon ITSS Task Leader: Dr. Anthony C. Danks

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The objectives of this task are to perform all phases of STIS Guaranteed Observing Time (GTO) scientific activities as STIS Co-Investigator including selection of scientific questions based on the current state of knowledge, selection of targets, instrument observing modes and exposure times based upon HST operational and STIS instrumental properties, updating of GTO observing proposals, GTO observing, data reduction, analysis and interpretation, publication, and presentations of scientific results. Travel to domestic and foreign observatories and scientific meetings will be necessary.

WORK ELEMENTS

100 Observation proposal, planning, and preparation

Adjustments will be needed to the RPS2 planning for all remaining GTO orbits, due to the recent STIS failure. The remaining GTO orbits have been divided between spectral observations of η Carina, and a search for a planet in a nearby stellar system.

200 Observation support

300 Data reduction and analysis

Analysis is proceeding on the η Carina stars. Six stars have been observed with STIS. The data have been reduced and both high and low excitation lines have now been measured. A large paper will be put together over the following 6 months describing the ISM around η Carina.

Further analysis of the STIS echelle observations of NGC4151 will be made, including detailed comparison with the GHRS observations of Weymann, which identifies many components of the interstellar medium along the line of sight. This analysis culminated in a talk, "ISM within NGC4151 and our Galactic halo". This talk will be presented by the task leader at the XVIIth IAP Colloquium, "Gaseous Matter in Galaxies and Intergalactic Space", in Paris, 19-23 June.

Analysis continued of STIS data on boron isotope lines in the η Carina direction, performed in collaboration with Lambert and Federman under a GO program.

400 Publication development

The talk described above, presented at the XVIIth IAP colloquium, will be developed as a publication.
Danks, A.C., Walborn, N.R., Vieira, S., Landsman, W.B., Gales, J., and Garcia, B., 2001 *ApJ*, 547, L155,

Non-Local Travel

Staff traveled to the XVIIth IAP Colloquium on "Gaseous Matter in Galaxies and Intergalactic Space" in Paris on June 19-23, 2001, presenting a paper.

METRIC EVENTS

201   At least one GTO observation series or ground-based observation per year

Comments: The observations (of interstellar boron) for the GO proposal submitted with Lambert and Federman were successfully completed. Data analysis is under way.

This metric will be revisited in consideration of current STIS problems.

401   Completion of reduction, analysis and draft publication of Cycle 8, 9, and 10 results

Comments: Processing was completed for the second paper on η Carina, and a draft is well under way. A third paper on highly ionized lines (e.g. SiIV) is in preparation.

The third paper on interstellar lines in the direction of NGC4151 is in preparation.

402   At least one scientific refereed publication per year

Comments: See 401, above. The IAP Colloquium talk will be the basis for a publication on NGC 4151 observations.

Danks, A.C., *Astrophys. & Space Science*, 269-270: 639-640, 1999 "The Origin of QSO Mg II $\lambda 2796$ Lines"
Danks, A.C., *Astrophys. & Space Science*, 272: 127-133, 2000 "Studies of the ISM in the Vela Supernova Remnant"
Danks, A.C., et al. *ApJ* 547, L15, 2001 "Rapid Temporal Variations of Interstellar Absorption Lines in the Carina Nebula"

GSFC ATR: Theodore P. Stecher
SWRI Subcontract Task
SWRI Task Leader: Dr. Joel Parker

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The purpose of this task is to provide support for research on the Large Magellanic Cloud using existing UIT data and ground-based data. The intended final product of this task is a publication to appear in a refereed journal.

WORK ELEMENTS

100 Analysis of UIT data

200 Analysis of ground-based and other non-UIT data

This element involves obtaining and combining UIT data for the entire SMC with photometric data from the Magellanic Cloud Photometric Survey (MCPS). Initial estimates are that these catalogs contain 11,000 and 1,000,000 stars, respectively, and the final catalog will have about 11,000 stars with UV+optical photometry and astrometry. A search will be made of the literature and private data sources for stars with high-quality, reliable spectroscopic classifications and astrometry. These classifications will be incorporated into the catalog. The temperatures and intrinsic colors of these stars will be used to calibrate the photometric catalog to allow us to estimate effective temperatures for the remainder of the "photometry-only" stars in the catalog. Using published lists of clusters, cluster membership of stars in the UV+visible catalog will be analyzed and compared against the UIT-based identification of OB associations/clusters (which should be more efficient due to our use of UV data, which have a positive bias for selecting hot stars). Field stars (> 2 arcmin from the boundary of a cluster) and extreme field stars (> 20 arcmin) will then be selected. The projected surface density of candidate O-type stars in the SMC will also be determined.

300 Preparation of manuscript for journal submission

Work will begin on completion of the analysis described above.

400 Publication support

Non-Local Travel

None

METRIC EVENTS

201 **Creation of UV+Optical Photometry Catalog (for Manuscript II)**
Completion date: March 9, 2001

Percent complete: 100%

Comments: A first cut has been made of a catalog based on the north-eastern region (NGC 346). This resulted in a sub-catalog of about 3000 stars. The software used for this was expanded to incorporate the entire SMC catalog. At this point, it was discovered that an unexpectedly small fraction of the UIT and MCPS catalogs were matching; only 4044 stars matched out of the UIT catalog of 11306 stars. Analysis showed that the reason was that the astrometry in the UIT catalog had large errors that made positional matching unreliable. To correct this problem, revised astrometry was performed on the entire UIT SMC catalog by re-fitting the positions on Digital Sky Survey (DSS) images to obtain a plate solution transforming from the incorrect UIT positions to the DSS X,Y system. This plate solution was used to transform all the catalog positions to DSS X,Y pixel coordinates, which were then transformed to a revised and improved set of RA and Dec coordinates using the original plate solution for the DSS image. This was done for each of the four UIT SMC images, then the resulting four catalogs (1713, 2110, 2517, and 4966 stars, respectively) were combined and values for stars that appear in the overlapping regions were matched and averaged. The resulting revised SMC catalog contains 10999 stars, 10317 of which now match with the MCPS catalog. The final catalog of UV+visible photometry is now complete.

301 **Manuscript ready for submission**
Completion date: August 31, 2001

Percent complete: 10%

Comments: Catalog, described above, is complete

401 **Submission of revised manuscript in response to referee's comments**
Completion date: TBD upon receiving referee's comments

Percent complete:

Comments:

GSFC ATR: Dr. Randy A. Kimble
Raytheon ITSS Task Leader: Dr. Timothy J. Norton

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The purpose of this task is to support the design, specification, fabrication, and evaluation of photon-counting intensified CID (charge injection device) detectors. This work will also include development of novel UV photocathodes including those deposited in silicon microchannel plates.

WORK ELEMENTS

100 Specification and evaluation of microchannel plate intensifiers

200 Specification and evaluation of commercial/custom CIDs and Active Pixel Sensors (APS)

300 Simulation, design, fabrication, and evaluation of CID and APS control electronics, and event centroiding electronics

Progress was made in developing IDL code with improved centroiding accuracy.

400 Design, fabrication, and evaluation of fiber optic coupling of intensifiers, CIDs and APS

500 Testing of components and integrated detector systems

600 Development of laboratory with facilities for vacuum deposition and spectroscopic quantum efficiency measurements

Troubleshooting led to the diagnosis and repair of a leak in the chamber's main 27-inch copper wire seal. After baking and cleaning, the UHV chamber was operated at a base pressure of 10^{-9} torr. This verifies capabilities of the chamber for vacuum deposition.

Design of the evaporation processing and tube assembly including custom flanges, tubes, and evaporation boats, and a feedthrough assembly, is complete. A custom flange and high-voltage feedthroughs were procured. A custom bakeable (at 300° C) 12" travel linear feedthrough and special wobble sticks for manipulation inside the chamber were also procured. Design of a cleanroom facility for integration is in process, including work on acquiring a suitable room.

The design and procurement of a heating plate, elements, and power supply for baking are complete. We are awaiting integration of these components by an electronics technician.

Rigging cables for lifting and moving the chamber were designed and installed.

The nitrogen backfill tanks and system for the UHV chamber were procured and connected.

Revisions were made to the system's plumbing to achieve a suitable pumping rate.

All parts for the heating oven power supply, servo temperature control unit, and the heating element array are acquired and ready for integration.

700 Study and develop techniques for depositing UV photocathodes, including those on doped diamond surfaces

Discussions were held with Dr. Joseph Stock (Swales) covering many areas, including the UHV facility, deposition techniques, and other issues.

800 Test properties of photocathode materials on silicon substrates, including QEλ and noise

900 Dissemination of results, including presentations, reports, and publications

Non-Local Travel

None

METRIC EVENTS

301   **Complete modeling study of event-driven APS intrapixel response vs. centroiding accuracy**
        Completion date: June 30, 2001

        Comments: Progress has been made on IDL centroiding software.

401   **Support design review of event-driven APS devices**
        Completion date: August 31, 2001

501   **Perform Silicon MCP Characterization, including gain, lifetime, and DGE**
        Completion date: August 31, 2001

        Comments: Work is progressing on the UHV chamber and facility.

801   **Perform activation and evaluation of ALGaN photocathodes**
        Completion date: August 31, 2001

802   **Perform activation and evaluation of opaque CsTe photocathodes**
        Completion date: August 31, 2001

901   **Complete draft publication on RACID results**
        Completion date: June 30, 2001

GSFC ATR: Dr. Edward S. Cheng
Raytheon ITSS Task Leader: Dr. Robert J. Hill

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The contractor will provide support to the Instrument Scientist Office for the Wide Field Camera 3 project. Activities will concentrate in the following areas:

WORK ELEMENTS

100 Instrument simulation development and maintenance

Considerable effort was made in supporting the design of the flight IR detector package for WFC3. The design has been tested and final modifications are being made.

Staff is supporting a review of the procedures used in the construction and processing of the WFC3 flight detector housings.

200 CCD detector characterization

CTE testing of Marconi CCD44 devices continued. Devices with 2.5 and 5 years of equivalent on-orbit radiation damage have been examined for degradation of CTE performance. This is part of an ongoing project to evaluate the CTE performance of CCDs over a range of proton damage equivalent to 0-5 years of expected on-orbit damage.

Staff has completed the characterization of three Marconi frontside engineering grade CCD43 flight model devices. Two of these devices were delivered to Ball Aerospace for incorporation into the surrogate CCD detector build.

Testing of 2 flight-like packaged WFC3-1R MUXes was completed in the DCL. One of these devices was delivered to Ball Aerospace for incorporation into the surrogate IR detector build.

Staff is supporting the testing of the first engineering grade HgCdTe detectors from Rockwell Science Center.

Staff supported the testing and debugging of three production interfaces for each of the CCD and IR detector test systems. These interfaces will be used in the characterization of the WFC3 flight detectors.

Mechanical and electrical interfaces are being designed to support the operation of the Lockheed CCD 486 device, which is intended to be the backup device for the WFC3 UVIS channel.

Staff constructed a temperature sensor calibration system with an overall resolution of 0.01K. This system will be used to calibrate the temperature sensors on the IR detectors for WFC3.

Staff continued to manage the development of improvements to the DCL software.

New code to permit dithering of a CCD device has been implemented. New code has also been developed to implement the charge injection capability of the Marconi flight model CCDs.

Staff has created a new prototype database and written a DCL Data Flow Design Document which will guide the development of future modifications to the DCL data acquisition systems and database.

Staff is supporting work on the construction of light tight enclosures around the DCL's illumination systems, which will allow simultaneous testing of more than one detector in the DCL.

Staff is supporting the implementation of a single pixel illumination system for the DCL.

300 Presentation and display material support

Staff presented results of recent testing of Marconi CCDs and Rockwell HgCdTe devices to the WFC3 SOC.

Staff supported the development of web-based tools that permit the comparison of WFC3 filter test results and detector quantum efficiencies for different types of detectors.

400 Administrative support

A master record system is being developed to provide documentation configuration control. This system will meet ISO requirements.

500 Instrument calibration and performance analysis

Staff is supporting the initial evaluation of the WFC3 thermal/vacuum test requirements. This includes a first look at the test sequence, staffing requirements and data analysis software needs.

Staff is supporting the development of the science calibration plan for the WFC3 instrument.

Non-Local Travel

Staff attended two CCD status report meetings in Chelmsford, UK.

Staff attended the March WFC3 Monthly Status Review at Ball Aerospace in Boulder, CO.

Staff attended the WFC3 Scientific Oversight Committee meeting at the University of Hawaii Institute for Astronomy in Hilo, HI.

Staff attended three IR detector status report meetings at Rockwell Science Center in Thousand Oaks, CA.

METRIC EVENTS

201   **Complete evaluation of WFC3-1R MUX**
        Completion date: March 15, 2001

        Percent complete: 100% on schedule

        Comments: WFC3-1R MUX is performing as expected.

202   **Complete QE and dark current measurements of Hawaii-IR technology demonstration devices**
        Completion date: N/A

        Percent complete:

        Comments: Cancelled by direction of ATR.

203   **Support development of single pixel illumination capability in the DCL**
Completion date: August 1, 2001

Percent complete: 80%

Comments: Concept verified and test setup almost complete.

204   **Complete CTE characterization of Marconi CCD44UVI at 5 years and CCD44VI at 2.5 years equivalent radiation damage**
Completion date: March 15, 2001

Percent complete: 100% on schedule

Comments: CCD44 radiation testing complete.

205   **Complete characterization of the first flight contract engineering grade Rockwell devices**
Completion date: August 1, 2001

Percent complete: 20%

Comments: Testing underway.

206   **Complete characterization of Marconi front-side illuminated devices**
Completion date: May 15, 2001

Percent complete: 100% on schedule

Comments:

207   **Complete characterization of Marconi backside illuminated engineering grade devices**
Completion date: September 30, 2001

Percent complete:

Comments: Devices scheduled for delivery in early July.

208   **Complete post-radiation CTE characterization of Marconi CCD43-152**
Completion date: September 1, 2001

Percent complete:

Comments: The device has been irradiated and is awaiting the availability of a test dewar.

301   **Present CCD and IR detector results to SOC meeting**
Completion date: June12, 2001

Percent complete: 100% on schedule

Comments:

NASA Task: 98D0036

ACS Calibration and Test Analysis

GSFC ATR: Dr. Edward S. Cheng
Raytheon ITSS Task Leader: Dr. Robert J. Hill

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The contractor will provide support for analyzing calibration and test data from the ACS instrument during its test period at GSFC.

WORK ELEMENTS

100 CCD subsystem performance analysis

Staff supported the attempt to develop Fairchild devices as a viable flight backup for the ACS WFC.

Staff supported the investigation and procurement of Marconi CCDs as a flight backup for ACS WFC.

Staff continued to monitor the progress of the CCD subsystem integration.

200 Instrument throughput and performance analysis

Staff supported the performance analysis and comparison of ACS with WFC3.

300 Instrument calibration and analysis support

Staff completed phosphorescence testing of ACS flight spare dewar windows.

Non-Local Travel

None

METRIC EVENTS

101   **Report on radiation testing of Lockheed 4kx4k device**
       Completion date: July 1, 2001

       Percent complete: 100% on schedule

       Comments:

201   **Report on thermal/vac performance of detectors**
       Completion date: N/A

       Percent complete:

       Comments: Cancelled by direction of ATR

301   **Periodic reports of analyses of specific instrumental characteristics**
Completion date: N/A

Percent complete:

Comments: Cancelled by direction of ATR

302   **Support ACS thermal/vac testing**
Completion date: N/A

Percent complete:

Comments: Cancelled by direction of ATR

303   **Support phosphorescence testing of ACS detector dewar window**
Completion date: July 1, 2001

Percent complete: 100% on schedule

Comments: Work completed and a test report was written.

GSFC ATR: Joseph Novello
Raytheon ITSS Task Leader: Ernest Buchanan

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The purpose of this task is to provide electrical engineering and control software support for development of the XRS/Clark, SAFIRE, HESSI, and other Code 680 projects. In addition, this task supplies electrical engineering, electrical technician, and mechanical fabrication support for other instruments and detector systems developed by Code 680.

WORK ELEMENTS

100 Triana development support

The engineering unit for PLASMAG was set up for an interface test. A procedure was developed for the integration and test of the spacecraft.

200 HESSI development support

300 Develop electronics for test and evaluation of cryogenic detector systems

The 4.2K analog subaddress driver (built from off-the-shelf CMOS logic circuits and analog switches) was tested and shown to operate at 4.2K.

Staff designed and built a battery charger for HAWC.

Staff designed an analog LCR filter box to isolate HAWC from equipment such as digital signal generators.

A sequencing power supply for CCDs, with multiple interlocks to ensure proper sequential application of detector voltages, was designed and built.

Staff consulted with FIBRE and BACCUS teams on a local oscillator source for FIBRE. Support was provided for training and advice for a student who is developing the local oscillator. Another student is being helped in developing a phase-lock amplifier.

Preparations for the observation run on Mauna Kea were supported.

400 Electrical technician support for other 680 instrumentation projects

500 Electrical engineering support for other 680 instrumentation projects

Some support was provided to the WFC3 task (98D0026) and is reported with that task's report.

600 Fabrication support for 680 instrumentation projects

Non-Local Travel

None

METRIC EVENTS

101　**Update Triana flight and ground software**
Completion date: July 31, 2001

Percent complete: 100%

Comments: Flight software delivered.

102　**Provide Triana S/C integration support**
Completion date: July 31, 2001

Percent complete: 50%

Comments: Support supplied as required.

301　**Provide electronics support for HAWC and SAFIRE detector evaluation and verification**
Completion date: August 31, 2001

Percent complete: 30%

Comments: In progress.

302　**Provide electronics support for evaluating electronics for IR instruments development**
Completion date: August 31, 2001

Percent complete: 30%

Comments: In progress.

303　**Provide electronics GSE for HAWC, SAFIRE, and other IR instruments subsystems**
Completion date: August 31, 2001

Percent complete: 30%

Comments: In progress.

501　**Provide WFC3 software modifications resulting from subsystems evaluation**
Completion date: July 31, 2001

Percent complete:

Comments: None required during this period

601   Provide a monthly record of fabrication support for 680 projects

Dates	Project	Contact

March:

03/01/01-03/02/01	WFC3 Dewar back plate, front vertical	J. Yagelovich
03/05/01-03/09/01	FIBRE Array mount towers, still bracket, dilution refrigerator bracket array mounting bracket	D. Benford
03/12/01-03/13/01	WFC3 base plates (2)	J. Yagelovich
03/13/01-03/13/01	FIBRE vibration damper	D. Benford
03/13/01-03/19/01	UKE TEC holder, thermal strap, detector mounting plate, dewar IR Base Plate	J. Yagelovich
03/19/01-03/20/01	Adapter plate (breadboard #2) , 55 mm lens holder	C. Bowers
03/21/01-03/22/01	detector mounting plates	J. Yagelovich
03/23/01-03/30/01	EUNIS telescope mirror mount	J. Novello

April:

04/02/01-04/03/01	Back plate, front vertical plate	J. Yagelovich
04/04/01-04/13/01	FIBRE calibrator (1.5 weeks)	D. Benford
04/13/01-04/16/01	WFC3 dewar to KF25 adapter	E. Sharp
04/16/01-04/17/01	RIE Adapter	A. Baer
04/17/01-04/17/01	Camera lens adapter	R. Oliversen
04/18/01-04/19/01	Laser alignment fixture	T. Plummer
04/20/01-04/20/01	TEC thermal strap	J. Yagelovich
04/20/01-04/23/01	HAWC connecting bracket	M. Freund
04/23/01-04/25/01	SCCDP	L. Payne
04/25/01-04/26/01	WFC3 dewar side plates	J. Yagelovich
04/26/01-04/27/01	Field lens occulter, lens holder	C. Bowers
04/30/01-04/30/01	Light baffle	J. Yagelovich

May:

05/01/01-05/01/01	Gluing jig, spacer	A. Baer
05/02/01-05/04/01	Field lens/occulter holder	B. Derro
05/05/01-05/15/01	Array mounting brackets	D. Benford
05/16/01-05/22/01	Biotech test chambers	M. Swartz
05/23/01-05/25/01	NGC Front panel	P. Haas
05/29/01-05/29/01	COR1 housings (4)	P. Britt
05/30/01-05/30/01	Thermal control box	T. Plummer
05/31/01-05/31/01	Dewar heat switch insulator	J. Yagelovich

June:

06/01/01-06/05/01	WFC3 bracket, DCL shutter holder	E. Sharp
06/05/01-06/07/01	Dewar heat switch	J. Yagelovich
06/08/01-06/12/01	Cold plate	D. Benford
06/13/01-06/15/01	WFC3 dewar sleeve, mounting plate	E. Sharp
06/18/01-06/18/01	Bolt modification	E. Sharp

GSFC ATR: Dr. George Sonneborn
Raytheon ITSS Task Leader: Dr. Derck Massa

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The purpose of this task is to provide support for evaluation analysis publications and presentations of pre- and post-launch data obtained by the Far Ultraviolet Spectroscopic Explorer (FUSE).

WORK ELEMENTS

Work ended on this task in late March due to the task leader's move to another contractor.

100 Support science planning of FUSE PI team programs involving observations of early-type stars

200 Support evaluation and analysis of post-launch FUSE data of early-type stars

Work continued on FUSE pipeline software, with a primary effort in characterizing changes in detector geometry as a function of photon rate.

Work continued on studies directed at modeling stellar winds to fit line profiles in hot stars. Efforts were focused on the use of Sobolev Exact Integration (SEI) techniques to fit all resonance line profiles, over the complete HST-FUSE wavelength range, in spectra of late O stars in the LMC

300 Support evaluation and analysis of data from the GI program "FUV Diagnostics of Structure in Hot Star Winds"

Non-Local Travel

None

METRIC EVENTS

201   **Support FUSE pipeline redesign discussions**
         Completion date: August 31, 2001

         Percent complete: 30%

         Comments: Work ended with move of the task leader to another contractor.

202   **Develop spectral analysis tools for evaluation of stellar wind lines**
         Completion date: April 30, 2001

         Percent complete: 50%

         Comments: Work ended with move of the task leader to another contractor.

203   **Submit FUSE-related paper**
         Completion date: August 31, 2001

         Percent complete: 30%

         Comments: Work ended with move of the task leader to another contractor

GSFC ATR: Dr. Eliahu Dwek
Raytheon ITSS Task Leader: Dr. Richard G. Arendt

QUARTERLY REPORT: MARCH 1 - JUNE 19, 2001

TASK OBJECTIVES

The purpose of this task is to provide support for analysis of infrared (IR) emission from supernova remnants (SNRs), and support for analysis aimed at deriving constraints on the near-IR cosmic background using data from the DIRBE instrument.

WORK ELEMENTS

100 Analysis of the IR emission from SNRs

200 Development of constraints on the near IR background using DIRBE

300 Decomposition of the gamma-ray emission at high Galactic latitudes

Color correction factors were calculated for values of the local ISRF determined from DIRBE data.

400 Dust temperature fluctuation analysis

A new IDL code was written to calculate dust temperature fluctuations and individual grain spectra using the formalism published by Guhathakurta & Draine (1989). The code can perform the calculations for grain compositions of silicate, graphite, PAH, and 4 types of amorphous carbon. The PAH emissivities were taken from recent work by Li & Draine (2001). In the course of applying this prescription, several errors were found in the manuscript. The authors were informed and subsequently submitted errata for their paper.

Miscellaneous other programming assistance was provided, including writing a program that can conveniently generate plots of any 3 DIRBE mollweide images for display purposes.

Non-Local Travel

None

METRIC EVENTS

301 **Contribute to preparation of a paper on the decomposition of high latitude EGRET data**
Completion date: August 31, 2001

Percent complete: 0%

Comments: (Metric number changed from 201 to match appropriate Work Element.)

302 **Prepare figures showing the results of the decomposition**
Completion date: August 31, 2001

Percent complete: 0%

Comments: (Metric number changed from 202 to match appropriate Work Element.)

303   Present ISRF spectrum as a function of Galactic (l,b)
Completion date: August 31, 2001

Percent complete: 0%

Comments: (Metric number changed from 203 to match appropriate Work Element.)

304   Present GCR spectrum as a function of Galactic (l,b)
Completion date: August 31, 2001

Percent complete: 0%

Comments: (Metric number changed from 204 to match appropriate Work Element.)

401   Development of dust temperature algorithms and preparations of corresponding report
Completion date: June 30, 2001

Percent complete: 100%

Comments: Completed.

402   Conversion of dust temperature fluctuation code from Fortran to IDL
Completion date: April 30, 2001

Percent complete: 100%

Comments: Completed. (Formerly metric number 101; the number has been changed to match the appropriate Work Element.)

403   Development of new dust temperature algorithms and preparation of a corresponding report
Completion date: July 31, 2001

Percent complete: 50%

Comments: Development of entirely new methods has been set aside in favor of the Guhathakurta & Draine approach. It is still uncertain if the new methods are actually workable. (Formerly metric number 102; the number has been changed to match the appropriate Work Element.)

GSFC ATR: Dr. Alan J. Kogut
Raytheon ITSS Task Leader: Paul A. G. Mirel

QUARTERLY REPORT: MARCH 1 – June 19, 2001

TASK OBJECTIVES

The purpose of this task is to provide support for research on the cosmic microwave background radiation.

WORK ELEMENTS

100 Support ARCADE balloon flight program

A task layout was developed for all action items leading up to the pre-launch system test.

The instrument was cold tested at 4 K. Thermal control was established and found acceptable for flight use. The 30 GHz signal path was tested and functioned properly and within acceptable noise. The 10 GHz amplifier failed under thermal stress. Arrangements were made to reattach the bond wires. A second amplifier body was located and its assembly ordered.

A new main oscillator and switch driver was designed, engineered, and fabricated after determining that the manufacturer's circuitry did not function properly. The new design incorporated late model power MOSFETs, optoisolation of critical timing circuits, proper thermal engineering, and better noise control. The new oscillator/driver was installed and tested. It functions properly and runs acceptably cool in a vacuum.

The final layout of the thermometer telemetry hardware was completed; a vendor was contracted to perform the PC layout. A servo control circuit was designed and fabricated to permit software control of payload motors.

Parts for the remaining major structural elements of the payload were designed, sent out for fabrication, and received. These parts included bracing elements for the lid mover, a movable pallet and linear bearing to allow active balancing of the payload, and actuator mounting hardware to allow active tilting of the dewar.

A payload rotator from the MSAM payload was located, found to be acceptable for use on the ARCADE payload, and plans to modify it were developed. Several potential lubricants were cold cycled to test for their ability to lock the slip bearing at flight ambient temperatures.

The new data acquisition unit was received and installed in flight configuration, and tested. It performed properly in conjunction with the new flight code written at JPL.

A graduate student has been brought in through CUA to assist in the laboratory. A digital camera was ordered, received, and tested.

200 Data reduction and analysis

Non-Local Travel

None

METRIC EVENTS

101   Develop hardware and software to process flight thermometer telemetry
Completion date: April 20, 2001

Percent complete: 100%

Comments: Complete circuit design sent to vendor to create PC layout and fabricate boards. Components ordered and prepared for population of two boards by same vendor.

102   Support ARCADE cold systems tests
Completion date: March 25, 2001

Percent complete: 100%

Comments: Cold system test in ground configuration complete.

103   Support ARCADE balloon launch (Palestine, TX)
Completion date: Summer 2001 or as scheduled

Percent complete: 35%

Comments: Instrument being assembled in flight configuration. The majority of mechanical parts have been received and await assembly and integration. Electrical control work in progress. Interface to software mostly complete. Full system test planned for early August.

201   Support flight data acquisition software development
Completion date: Summer 2001 or as scheduled

Percent complete: 30%

Comments: Staff worked closely with JPL staff who are developing flight and ground code. Supplied technical information about instrument and subsystem wiring and architecture; specified software interface needs.

NASA Task: 9810046   **Infrared Spectrophotometer Development**

GSFC ATR: Dr. Harvey Moseley
Raytheon ITSS Task Leader: Timothy Powers

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The purpose of this task is to support the development of infrared instruments and detectors (e.g. for the SPIRE instrument), including both software and hardware elements. Support will include fabrication and testing of instrument dewars and bolometers used for infrared (IR) astronomical observations, and in the design of instrument control systems for use in detector testing and operations.

WORK ELEMENTS

100 Prepare and execute cryogenic experiments for evaluation of TES bolometers (e.g., Planar Hybrid Bolometers (PhyBs) and Microbolometers)

We have run tests on two sets of candidate TES's. Additional tests, to evaluate transition temperature as a function of doping percentage, are continuing.

200 Execute tests to validate cryogenic and mechanical designs for detector system elements

Motors were received from Donovan Microtek and tested at LN_2 temperatures. They failed because a lubricant fused. Subsequent discussion with the supplier revealed they are actually vacuum motors; we are negotiating to get real cryomotors.

Staff supported tests for the IRAC shutter, which is still malfunctioning. It has not been determined why the shutter door is remaining open on the flight instrument. The problem has not been duplicated on the flight spare.

Testing and assembly of a detector array characterization package in the dilution refrigerator is ongoing. This package is being used to characterize current SQUID multiplexers and PhyB bolometer arrays. It contains a circuit board with cryogenic superconducting electronics, SQUID chips, inductor chips, and bolometer array chips.

A prototype flight-like cryogenic address board (breadboard version) has been fabricated and tested to verify high-speed performance in a cryogenic environment.

300 Support the development of instruments using TES bolometers, such as FIBRE and SPIFI

A new cryostat has arrived (the "purple dewar") with a two stage ^{3}He refrigerator . We are beginning integration and preparation of that system for use as a detector test platform.

FIBRE was developed, tested, packed, and shipped to Mauna Kea (the Caltech Submillimeter Observatory) where it successfully operated in spite of bad weather. Performance was within specifications.

400 Provide documentation and organizational support to infrared instrument and detector-related projects

Administrative and organizational support was supplied to IR projects. Work included project schedule maintenance, organization of documentation, travel support, facilitating e-mail and telephone communication among project scientific staff, and meeting and visitor support.

Non-Local Travel

None

METRIC EVENTS

101   **Develop second generation MUX testing hardware to support detector development**
Preliminary completion: May 1, 2001
Final delivery: August 31, 2001

Percent complete: 100%

Comments: Initial MUX tests were begun by May 1 and are complete.

102   **Develop and test SQUIDs and associated boards to support detector development**
Preliminary completion: June 1, 2001
Final delivery: August 31, 2001

Percent complete: 100%

Comments: Initial development is complete; SQUIDs operated successfully and on FIBRE at Mauna Kea.

103   **Develop GSE for detector development**
Completion date: August 31, 2001

Percent complete: 40%

Comments: The cryogenic address board is in breadboard form.

201   **Provide test support for validation of detector system elements (e.g., inductors)**
Preliminary completion: March 30, 2001
Final delivery: August 31, 2001

Percent complete: 30%

Comments: First test trial run of SQUID multiplexers in the dilution refrigerator was successful.

202   **Develop test equipment for low-temperature testing (e.g., 2-stage ^{3}He refrigerator)**
Preliminary completion: March 30, 2001
Final delivery: August 31, 2001

Percent complete: 60%

Comments: Integration of the test station setup is under way.

203   **Develop test equipment for optical testing (e.g., FTS setup)**
Preliminary completion: May 1, 2001
Final delivery: August 31, 2001

Percent complete: 0%

Comments: FTS setup has still not arrived from manufacturer.

301   **Provide test support for FIBRE instrument**
        Preliminary completion: March 30, 2001
        Completion date: August 31, 2001

        Percent complete: 80%

        Comments: The Mauna Kea run was successful.

302   **Provide test support for SPIFI (south pole imaging FP) instrument**
        Preliminary completion: March 30, 2001
        Completion date: August 31, 2001

        Percent complete: 10%

        Comments: The plan for supporting the tests is complete.

401   **Provide scientific/technical documentation of detector performance suitable for publication**
        Preliminary completion: June 1, 2001
        Completion date: August 31, 2001

        Percent complete: 30%

        Comments: Staff presented three posters at the AAS meeting at Pasadena, CA in June.

GSFC ATR: Dr. Ronald J. Oliversen
Raytheon ITSS Task Leader: Dr. Robert Cornett

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The purpose of this task is to provide support for the maintenance and operations of the Goddard 36-inch Telescope Test Facility and related research projects.

WORK ELEMENTS

Work has been at a low level since March due to funding limitations and the task leader's being unavailable due to other commitments.

100 Equipment design, construction, and testing

200 Operations and observation support

300 Data reduction and analysis

400 Training and facility use support

500 Facility maintenance and upgrade

Non-Local Travel

None

METRIC EVENTS

101   Upgrades to Fabry-Perot spectrometer
        Completion date: August 31, 2001

        Percent complete:

        Comments:

102   Upgrades to CCD imager
        Completion date: May 31, 2001

        Percent complete:

        Comments:

301   Update observational parameters of the NSO Groundbased Io [OI] database
        Completion date: April 30, 2001

        Percent complete:

        Comments:

302   Pass 1 reduction of 1999 Io [OI] data for Galileo I25 encounter
         Completion date: August 31, 2001

         Percent complete:

         Comments:

GSFC ATR: Dr. Brian R. Dennis
Raytheon ITSS Task Leader: Anne K. Tolbert

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The purpose of this task is to provide support for obtaining, cataloguing, analyzing, archiving, and disseminating various data sets of interest to the members of the Solar Physics Branch.

WORK ELEMENTS

100 HESSI data acquisition, cataloguing, archival, and analysis

The HESSI launch, scheduled to occur during June, has been postponed indefinitely due to the recent failure of a launch vehicle similar to the one planned for use with HESSI. Staff will continue to develop software in support of a launch that can occur no earlier than September 21, 2001.

Task members attended HESSI Data Analysis software meetings March 13, April 10, May 8, May 25, June 5, and June 19 conducted by conference calls between GSFC, UCB, Lockheed, and ETH.

Staff attended the second HESSI Data Analysis Workshop (HEDAW) at UCB February 28 and March 1-2. Team members delivered presentations describing HESSI spectroscopy and the HESSI Graphical User Interface.

Approximately 35 potential users of HESSI data from around the world attended the UCB HEDAW data analysis workshop. Over three days, HESSI team members described the HESSI instrument and software and assisted attendees in learning to set up and use the HESSI software. Staff worked with UCB personnel to support the UCB HEDAW as follows:
- Set up a number of PC's and X terminals for users without laptops
- Provided network connections and setup assistance for users with laptops
- Improved the HESSI SSW and test data installation CD and tested it on Windows 95, 98, NT, and 2000
- Created multiple copies of the HESSI SSW and test data installation CD with instructions for installation
- Provided general hardware and software support to individual users during workshop
- Created HEDAW Web pages

The UCB network failed the day before the workshop, requiring last minute modifications to software installation and setup instructions. The network was down for the entire workshop.

Task members worked on the following specific software areas:
- Rewrote the fitting object to store the data and response matrix.
- Incorporated an algorithm manager into the fitting object to handle fitting data by various methods.
- Wrote a routine to write standards-compliant FITS files for the HESSI spectrum object.
- Wrote an efficient IDL routine to re-bin spectra from one set of energy bins to another.
- Made progress on incorporating nuclear line templates in SPEX.
- Wrote a widget interface to the HESSI spectrum data. The interface provides simple options for binning in energy and time, and creates an output file suitable for importing to SPEX for spectral analysis of HESSI data.
- Wrote a widget interface to provide access to the HESSI quicklook images.
- Implemented a progress bar with cancel option and incorporated it into each image algorithm procedure.
- Modified routines to reconcile calibration problems.
- Revised science packet unpacking routines to use less memory, be more robust to various error conditions, and report the livetime counter and ULD and CSA words.
- Incorporated the spectroscopy response matrix routines into an SRM object for use with the spectrum object.
- Added getaxis method for the image, spectrum, and lightcurve objects.

- Improved the standard HESSI routines for locating data files.
- Implemented new fields into the calibrated eventlist to support image reconstruction of sources with time-variable intensity.
- Incorporated Dr. E. Schmahl's (U of Md) method for determining optimal time binning for image reconstruction.

Task members are working with Drs. R. Murphy and G. Share (NRL) to support tests on high energy flare models in the intensity range expected for HESSI data sets. Staff is also working with Dr. Share to analyze YOHKOH GRS and HXS data and to integrate the superfit routine into the SPEX environment.

Staff wrote a Frequently Asked Questions (FAQ) Web page for HESSI software installation and setup, as well as for frequent problems running the HESSI software.

Task members reduced and summarized data for the HESSI flight attenuators for Dr. G. Hurford (UCB).

Task members continued to work with S. Freeland (Lockheed) and R. Bentley (MSSL) to improve the SSW installation scripts for PC's and to improve and streamline the Web documentation for SSW installation.

Staff installed and configured Linux on a PC for testing the HESSI software in a Linux environment. In the process, staff tracked down a bug in the SSH software bundled with Red Hat Linux and reported the bug to Red Hat. Staff upgraded the software to provide full SSH functionality.

Staff submitted purchase orders for PCs, laptops, printers, software, disk drives, and more.

RITSS staff continued to update and improve the HESSI and SUNBEAMS web sites.

Task members performed the following tasks related to the Summer Student Program:
- Created a new LASP Summer Student Web Page
- Recruited and placed students within LASP for the summer
- Organized student presentations and seminars with guest speakers
- Organized student luncheons and field trips
- Tracked summer student budget and Catholic University expenses

Task members provided PC and Unix system administration support.

200 Complementary data acquisition, cataloguing, archival, and analysis

RITSS staff supports the Solar Software (SSW) IDL tree used by the solar scientific community by contributing useful software and maintaining existing software.

Staff continued to provide software advice and assistance to A. Kiplinger (SEC) regarding HXRS data.

Staff contributed to the following publication, submitted to *Solar Physics*, 17-May-2001:
"Gamma-Ray Line Observations of the 2000 July 14 Flare and SEP Impact on the Earth",
G.H. Share, R.J. Murphy, A.J. Tylka, R.A. Schwartz, M. Yoshimori, K. Suga, S. Nakayama, H. Takeda

Non-Local Travel

Staff made two trips to U. California (Berkeley).

METRIC EVENTS

101 **HESSI data analysis pre-launch software**
     Completion date: TBD dependent on launch date currently scheduled for mid-September, 2001

     Percent complete: 95%

     Comments: Date changed 6/20/01 with concurrence of ATR. Launch date postponed to be no earlier than mid-September 2001

102 **Launch and turn-on support**
     Start date: Unknown
     Completion date: TBD dependent on launch date currently scheduled for mid-September, 2001

     Percent complete:

     Comments: Date changed 6/20/01 with concurrence of ATR. Launch date postponed to be no earlier than mid-September 2001

103 **Documentation - HESSI User's Guide**
     Completion date for Version 1: September 21, 2001

     Percent complete: 60%

     Comments: Completion date changed 6/20/01 with concurrence of ATR.

104 **Documentation – Web Site Archive of HESSI Documentation**
     Completion date for Version 1: September 21, 2001

     Percent complete: 85%

     Comments: Completion date changed 6/20/01 with concurrence of ATR.

GSFC ATR: Dr. Joseph M. Davila
Raytheon ITSS Task Leader: Dr. Leon Ofman

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The purpose of this task is to provide numerical simulations of the magnetohydrodynamic dissipation processes in the solar wind and the solar corona.

WORK ELEMENTS

100 Data analysis

200 Model development

Development of the three-fluid 2.5D MHD model of the solar wind was completed. Using the model we have shown that the unresolved Alfvenic fluctuations in the solar coronal holes lead to apparent proton temperature and anisotropy consistent with SOHO/UVCS observations. However, Alfven waves with realistic amplitudes can not reproduce the observed O^{5+} perpendicular temperature and anisotropy. This suggests that the minor ions are heated by a different mechanism than protons.

300 Preparation of publications

See Metric Event 301, below.

400 Dissemination of results

See Metric Event 401, below.

Non-Local Travel

None

METRIC EVENTS

201   **Develop three-dimensional MHD model of waves in a curved, gravitationally stratified, coronal magnetic field structure**
Completion date: August 31, 2001

Percent complete: 80%

Comments: New 3D MHD model of active region magnetic field is under advanced stages of development. The model includes curved field lines and gravity.

301 **Prepare at least one scientific paper discussing research**

Percent complete: 100%

Comments: A paper that describes a new technique of the determination of coronal magnetic field from coronal loop oscillations was accepted for publication in *Astronomy and Astrophysics Letters* (Nakariakov & Ofman 2001).

A paper on the interaction of EIT waves with 3D coronal structures is in preparation.

401 **Present research results at at least one scientific meeting per year**

Percent complete: 100%

Comments: A talk on the interaction of an EIT wave with 3D coronal structure was presented at the Spring AGU/SPD meeting in Boston, MA on May 30, 2001.

GSFC ATR: Dr. Joseph M. Davila
Raytheon ITSS Task Leader: Dr. Jeffrey W. Brosius

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The purpose of this task is to develop models for the microwave, EUV, and related emissions from thermal structures in the solar atmosphere.

WORK ELEMENTS

100 Data analysis

Staff continued work on coronal magnetography using coordinated CDS EUV and VLA microwave observations of NOAA region 8108 obtained during the SERTS/CDS cross-calibration campaign of 1997. The reliability of coronal magnetograms depends upon the accuracy of the CDS calibration, the latter of which is established by the coordinated SERTS and CDS observations. Differential Emission Measure (DEM) results from EIT were provided by J. Newmark and J. Cook (NRL), enabling staff to extend the coronal magnetic field measurements to a nearby strong sunspot. By scaling the Fe XIV density (derived from the density-sensitive 353.8/334.2 ratio obtained with CDS) with the EIT Fe XII intensity, staff were able to estimate the corresponding electron density in the sunspot (for which no CDS observations are available).

In collaboration with F. P. Keenan, M. Mathioudakis, A. C. Katsiyannis, C. A. Ramsbottom, and K. L. Bell (all at The Queen's University of Belfast, Belfast, Northern Ireland), and R. J. Thomas (GSFC), Staff contributed to intercomparisons between SERTS spectra and recent theoretical computations for Mg VI.

200 Model development

Detailed work on coronal magnetography continued. Effort focused on improving the iterative procedure that places the gyroresonance harmonics for each of the X- and O-modes in appropriate atmospheric temperature regimes such that model calculations reproduce the observed radio emission. Calculations based upon this method reproduce the observed sunspot radio emission at all observation frequencies very well. This yields magnetic field strength as a function of temperature. This was converted to a function of height using the magnetic scale height as estimated from the radio brightness temperature maps. The results, when compared with the height derived from the emission measure and the electron density, yields volume filling factors around 5%.

300 Preparation of publications

(a) "A Comparison of Theoretical Mg VI Emission Line Strengths with Active Region Observations from the Solar EUV Rocket Telescope and Spectrograph (SERTS)," F. P. Keenan, M. Mathioudakis, A. C. Katsiyannis, C. A. Ramsbottom, K. L. Bell, R. J. Thomas, and J. W. Brosius, submitted (2001).

400 Dissemination of results

Results of the coronal magnetographic calculations were presented at the Solar Physics Division (SPD) meeting held in conjunction with the American Geophysical Union (AGU) in Boston, MA, May 29 - June 2, 2001.

Non-Local Travel

None

METRIC EVENTS

201   **Develop models that use SERTS data to understand solar processes**
       Completion date: August 31, 2001

       Percent complete: 80%

       Comments: Sunspot coronal magnetography modeling is nearly completed, and will be written up for publication in *ApJ* during the summer.

301   **Prepare at least one scientific paper discussing research**

       Percent complete: 100%

       Comments: (a) "Analysis of a Solar Active Region EUV Spectrum From SERTS-97," J.W. Brosius, R.J. Thomas (GSFC), J.M. Davila (GSFC), & E. Landi (MPIA), *ApJ* 543, 1016 (10 Nov 2000).

       (b) "A Comparison Between Theoretical and Solar Fe XII UV Line Intensity Ratios," A. M. Binello, E. Landi, H. E. Mason, P. J. Storey, and J. W. Brosius, *Astron. Astrophys.*, in press, 2001. (a) "Analysis of a Solar Active Region EUV Spectrum From SERTS-97," J.W. Brosius, R.J. Thomas (GSFC), J.M. Davila (GSFC), & E. Landi (MPIA), *ApJ* 543, 1016 (10 Nov 2000).

       (b) "A Comparison Between Theoretical and Solar Fe XII UV Line Intensity Ratios," A. M. Binello, E. Landi, H. E. Mason, P. J. Storey, and J. W. Brosius, *Astron. Astrophys.*, 370, 1071 (2001).

       (c) "A Comparison of Theoretical Mg VI Emission Line Strengths with Active Region Observations from the Solar EUV Rocket Telescope and Spectrograph (SERTS)," F. P. Keenan, M. Mathioudakis, A. C. Katsiyannis, C. A. Ramsbottom, K. L. Bell, R. J. Thomas, and J. W. Brosius, submitted (2001).

401   **Present research results at at least one scientific meeting per year**

       Percent complete: 100%

       Comments: Results of SERTS solar EUV spectra presented at the SPD meeting in Stateline, NV (*BAAS*, vol. 32, pg. 845, 2000).

       Results of coronal magnetographic work presented at the SPD meeting in Boston, MA, May 29 - June 2, 2001: "Measurements of 3-D Sunspot Coronal Magnetic Fields From Coordinated SOHO EUV and VLA Radio Observations," J. W. Brosius, E. Landi, J. Cook, J. Newmark, N. Gopalswamy, and A. Lara, *Eos* (*Supplement*), vol. 82, p. s315 (2001).

GSFC ATR: Dr. Susan G. Neff
Raytheon ITSS Task Leader: Dr. Robert Cornett

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The purpose of this task is to support research aimed at assessing the relationship between the star formation history and the apparent dynamical state of merging galaxies.

WORK ELEMENTS

To accommodate funding profiles, no work was performed on this task during this reporting period. Work will resume in late June.

100 Observation planning, preparation, and execution

200 Data reduction and analysis

300 Modeling and software development

400 Publication development

Non-Local Travel

None

METRIC EVENTS

101   **Planning and execution of observing at Kitt Peak National Observatory:**
        One trip per year, depending on proposal success

        Comments:

201   **Reduction and calibration of data from observing runs:**
        Three months after return from observation trip

        Comments:

401   **Presentation of paper or poster on results at scientific meeting or colloquium:**
        One per year

        Comments:

GSFC ATR: Dr. Robert F. Silverberg
Raytheon ITSS Task Leader: Dr. Dale J. Fixsen

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The purpose of this task is to provide support for design, testing, flight preparations, flight operations, and data analysis for the Medium Scale Anisotropy Measurement (MSAM) and top-mounted balloon borne instrument.

WORK ELEMENTS

100 Data reduction and analysis

Staff created 5 sky maps using the flight data, one for each frequency. They show the structure of the Galaxy, verify the pointing and permit calculating the gain. The next step will be to deconvolve the 5 maps into two, one for the CMBR and one of the Galaxy. Discussions were held with staff at U. Chicago on the map-making, which will support the efforts in creating maps at U. Chicago as well as at GSFC.

Staff supported writing a paper on the pre-amplifier used for TopHat, the first TopHat publication. It appeared in the June, 2001 issue of *Reviews of Scientific Instruments*.

Staff wrote a paper on the TopHat dewar, also to appear in *Reviews of Scientific Instruments*, in July 2001. Staff wrote a paper on the design of the input horn ("Multimode Antenna Optimization") to be presented at the annual SPIE conference in San Diego July 29-August 3.

Non-Local Travel

Staff traveled to Chicago to support development of a publication on multimode antenna optimization.

METRIC EVENTS

101   **Complete flight data analysis, including special-purpose analysis software**
        Completion date: September 19, 2001

        Percent complete: 50%

        Comments: Single-frequency maps are under way; algorithms and techniques are written.

NASA Task: 99F0026   **FIR/Submillimeter Interferometer Design Studies**

GSFC ATR: Dr. David Leisawitz
Raytheon ITSS Task Leader: Dr. Xiaolei Zhang

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The purpose of this task is to provide support for science requirement specification, mission concept development, optical/mechanical design studies, laboratory testbed interferometer assembly and development, and proposal support for the Submillimeter Probe of the Evolution of Cosmic Structure (SPECS) and related precursor missions.

WORK ELEMENTS

100 Science requirement specification

Studies continued on the cosmological evolution of galaxies to provide additional background for the design study of the far IR missions. A new contributed paper is being accepted for the Second European Conference on Galaxy Evolution. The secular evolution scenario is obtaining increased support from the new deep survey data (notably SDSS which was reported at the June AAS meeting). Work continues on two proposals on galaxy evolution studies in collaboration with scientists from STScI and U.C. Berkeley.

200 Mission concept development

Staff continued concept development and studied the relative merits of Michelson and Fizeau interferometer configurations.

300 Optical/mechanical design studies

Optical/mechanical design studies were carried out in conjunction with the work on the WIIT testbed.

400 Laboratory assembly and development of the Wide-field Imaging Interferometry Testbed (WIIT)

Staff led the effort in the alignment and troubleshooting of the WIIT testbed after initial assembly. Laser fringes have been detected in both the pupil plane and image plane. Fringe modulation depth now has improved to near 100%. Refinement of the system setup for white-light fringe detection and one-dimensional interferometry is in progress. Problems with an off-the-shelf beam splitter cube were discovered after laboratory testing and computer analysis. Staff then specified new requirements for a custom-made beam splitter, manufactured in California, which has just arrived.

A new round will soon begin of laboratory assembly, alignment and testing, in the process of which other newly arrived parts, including a linear air-bearing track and two rotary air-bearing stages, will be installed. Staff also worked on the specification and implementation of the data acquisition system. Acquisition software was written using the package Labwindows/CVI that complements the functionality of the existing LabView routines. Development continued of the data analysis procedure for WIIT.

500 Proposal support

Staff supported various SPECS related proposal efforts.

Non-Local Travel

Staff went to Big Sky, Montana to attend the IEEE Aerospace Conference, to present a paper on WIIT testbed. Staff went to Pasadena, CA to attend the semi-annual meeting of the AAS, to present two papers.

METRIC EVENTS

201   **Support biweekly meetings of the FAR/IR Mission Study Working Group
        Biweekly per meeting schedule**

      Percent complete: On-going throughout the contract period

      Comments: Completed on schedule

301   **Present paper on WIIT at IEEE conference in Big Sky, Montana
        Completion date: March 31, 2001**

      Percent complete: 100%

      Comments: Completed on schedule

401   **Use the WIIT testbed to detect fringes
        Completion date: March 01, 2001**

      Percent complete: 100%

      Comments: Completed on schedule

402   **Reconstruct a 1-dimensional image using the WIIT testbed
        Completion date: August 31, 2001**

      Percent complete: 50%

      Comments:

NASA Task: 99G0026   CGRO Publication Development Support

GSFC ATR: Dr. Neil Gehrels
Raytheon ITSS Task Leader: Dr. Peter J.T. Leonard

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The purpose of this task is to provide support for the publication of a feature article on gamma-ray bursts (GRBs) for Scientific American magazine, and a review article on the scientific accomplishments of the Compton Gamma Ray Observatory (CGRO) for Reviews of Modern Physics.

WORK ELEMENTS

100 Literature searches on GRBs and scientific results of CGRO

Searches through *Nature* and *Science* magazines for articles on GRBs, CGRO and gamma-ray astronomy were updated. In addition, 41 pages of notes were taken at the *Gamma-Ray Astrophysics 2001* meeting in Baltimore, April 3 to 6, 2001.

200 Preparation of manuscripts on GRBs and scientific results of CGRO

The draft of the article on GRBs and the accompanying figures are almost ready for submission to *Scientific American* magazine.

300 Subsequent publication support

Non-Local Travel

None.

METRIC EVENTS

201   Manuscript on GRBs ready for submission to *Scientific American*:
Completion: July 1, 2001

Percent complete: 95%

Comments: Touching up draft for submission, and finalizing figure selections.

202   Support development of a manuscript on scientific results of CGRO ready for submission to *Reviews of Modern Physics*:
Completion: August 31, 2001

Percent complete: 25%

Comments: Took 41 pages of notes at Gamma-Ray Astrophysics 2001 Meeting in Baltimore.

301   Submission of revised manuscript on GRBs in response to editor's comments:
        Completion: TBD upon receipt of comments

        Percent complete:

        Comments:

302   Submission of revised manuscript on scientific results of CGRO in response to referee's
        comments:
        Completion: TBD upon receipt of comments

        Percent complete:

        Comments:

GSFC ATR: Dr. Alan J. Kogut
Raytheon ITSS Task Leader: Dr. Nicholas Phillips

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

This task provides support for research and simulations of the cosmic microwave background radiation.

WORK ELEMENTS

100 Support simulations and analysis of CMB anisotropy

The neural network analysis code now operates at the resolution and noise profiles of COBE/DMR.
A more robust formalism was developed and applied.

An algorithm and formalism for predicting uncertainties has been developed and included in the parameter fit. This is a major step forward, because we have now made one complete design and implementation pass through the requirements for this project. We now have all the elements that a traditional maximum likelihood analysis provides, and they can be compared with other methods directly. The results of the comparison show good agreement with the traditional maximum likelihood analysis developed by the COBE/DMR team.

The two elements described above were incorporated into the draft manuscript, which is now nearly complete.

200 Support polarization mapping of diffuse microwave emission

Non-Local Travel

None

METRIC EVENTS

101 Draft publication for parameter estimation using neural networks
Completion date: June 30, 2001 (revised w/ATR concurrence)

Percent complete: 90%

Comments: Refinement of research results going into the publication (per ATR concurrence) required additional time.

102 Develop algorithm for neural network tied to HEALPIX pixelization
Completion date: June 30, 2001

Percent complete:

Comments: To follow draft publication above.

103 **Draft publication for Galactic polarization signals from COBE/DMR data**
   Completion date: August 31, 2001

   Percent complete:

   Comments: To follow draft publication above.

NASA Task: 9910066   SAFIRE/HAWC Instrument Development Support

GSFC ATR: Dr. Harvey Moseley
Raytheon ITSS Task Leader: Timothy Powers

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The purpose of this task is to provide technical support for evaluation and test of cryogenic components used in the SAFIRE and HAWC SOFIA instruments. This work will include design of test fixtures, interfacing components to test cryostats, executing experiments, and reporting the results to the team. Documentation and organizational support for this effort are included.

WORK ELEMENTS

100 Development of test equipment and environments

Staff supported wiring and preparation of a 2-stage ^{3}He cryostat for testing a prototype 2-dimensional popup detector array for SAFIRE. This cryostat is designed to reach 220 mK, which is sufficient to test ultralow background bolometer arrays.

200 Component and system test support

· A significant effort resulted in completion of the entire first series of detector tests including taking load curves. Testing has subsequently shifted to 1x32 arrays. Support was provided for cooling and cycling dewars, connecting heaters and thermometry, and taking data. The current emphasis is to develop 1x32 test facilities for evaluation of responsivity and spectral response. This setup will be used for screening of candidate arrays for the HAWC instrument.

The FIBRE instrument underwent substantial rapid testing and characterization prior to being shipped to the Caltech Submillimeter Observatory at Mauna Kea. The instrument was used for 6 consecutive nights during a period of very bad weather. The instrument worked nearly perfectly. We verified optical performance and wavelength tuneability and showed that noise was entirely dominated by photon arrival statistics (background). Unfortunately only the Moon was detected. Nevertheless the FIBRE has adequately demonstrated all crucial component technologies for SAFIRE: the cryogenic Fabry-Perot, the background-limited bolometer array, SQUID multiplexed amplifiers, and high-speed data acquisition electronics and software. The next step will be to make a 2-dimensional array that will demonstrate the mechanical aspects of making a large-format close-packed detector array.

J. Chervanak's next-generation TES devices (with a molybdenum layer only) were put into BACUS for cold tests, which demonstrated a near-theoretical sharp transition at the molybdenum T_c of approximately 900mK. This demonstrates that it is possible to evaporate high quality molybdenum layers onto Si substrates.

300 Documentation and organizational support

Administrative and organizational support were supplied to the HAWC and SAFIRE projects. Work included project schedule maintenance, organization of documentation, travel support, facilitating e-mail and telephone communication among project scientific staff, and meeting and visitor support.

Non-Local Travel

Staff traveled to Mauna Kea, HI to support FIBRE observations.

METRIC EVENTS

101　Provide cryogenics and electronics engineering support for detector research and development, including test and verification, for the SAFIRE detectors, optics, and electronics
Completion date: August 31, 2001

Percent complete: 80%

Comments: Extensive support was supplied for the Mauna Kea tests.

102　Provide scientific analysis, oversight, management, and support, for test equipment and facilities for the SAFIRE instrument
Completion date: August 31, 2001

Percent complete: 80%

Comments: Extensive support was supplied for the Mauna Kea tests.

103　Provide cryogenics and electronics engineering support, scientific oversight, and evaluation for detector testing/screening component of the HAWC project
Completion date: August 31, 2001

Percent complete: 30%

Comments: The first series of detector tests is complete.

201　Provide cryogenics and electronics engineering support for detector research and development, including test and verification, for the SAFIRE instrument
Completion date: August 31, 2001

Percent complete: 80%

Comments: Extensive support was supplied for the Mauna Kea tests.

202　Provide scientific analysis and oversight, scientific/technical management, and scientific/engineering support, for the SAFIRE project
Completion date: August 31, 2001

Percent complete: 80%

Comments: Extensive support was supplied for the Mauna Kea tests.

203　Provide cryogenics and electronics engineering support, scientific oversight, and evaluation for detector research and development, specifically for test and verification, for the HAWC project
Completion date: August 31, 2001

Percent complete: 60%

Comments: The first series of detector tests is complete.

301   Transfer experience-based knowledge of HAWC detector fabrication and assembly to U. of Chicago staff on the HAWC team
Completion date: August 31, 2001

Percent complete: 60%

Comments: Ongoing

302   Transfer experience-based knowledge of HAWC detector testing, calibration, and operation to U. of Chicago staff on the HAWC team
Completion date: August 31, 2001

Percent complete: 60%

Comments: Ongoing

303   Provide documentation as necessary for reviews, especially FAA airworthiness reviews, for the HAWC and SAFIRE instruments
Completion date: August 31, 2001

Percent complete: 60%

Comments: Provided as required.

GSFC ATR: Dr. Charles Bennett
Raytheon ITSS Task Leader: Susan Wright

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

This task supports IR program activities in the following elements including the Microwave Anisotropy Probe, IR balloon flights, and instrument development for FIRST/SPIRE, SOFIA/HAWC, and SOFIA/SAFIRE.

WORK ELEMENTS

100 Project documentation support

- An annual calendar of events and deadlines for the branch was maintained and updated, as needed. The new activities for year 2001 are currently updated and available in the calendar.

- The e-mail list for the IR Program staff is currently up to date and is being maintained and updated as needed. The list has also been incorporated into the IR branch website for access only by NASA Goddard Space Flight Center employees.

- An organization diagram, including location and contact information for all IR Program staff is also maintained and updated as needed. The long-term goal of this effort is aimed toward development of a web page as the primary database for IR Program reference material. The branch organization chart is maintained and updated as new employees join the branch. Also included in the organization diagram is a current list of long-term visitors.

Other program support included continuing logistics support for travel to scientific meetings. Staff coordinated registration and travel arrangements for the annual American Astronomical Society meeting held in Pasadena, California (June 3-7, 2001). Staff also prepared both domestic and international travel arrangements for several major scientific meetings. Some examples include the Next Generation Space Telescope's International Partnership Discussions held in Rome, Italy (April 1-5, 2001), the 36th International Colloquium, to be held in Liege, Belgium (July 2-5, 2001), the 2K1BC Workshop "Experimental Cosmology at mm-waves" to be held in Breuil-Cervinia, Italy (July 9-13, 2001) and several NGST (Next Generation Space Telescope) conferences held throughout the year.

Staff attended ODIN's Meeting Maker End User Training held at NASA, Goddard Space Flight Center May 14, 2001.

200 Proposal preparation support

Logistical support was provided for proposal preparation within the IR Program.

300 Database development and maintenance

Database development during this quarter included acquiring and formatting material for:

- The annual events calendar, updated and maintained through December, 2001. Staff is currently getting all pertinent dates for the next year and incorporating them into the calendar.

- Development of an e-mail address list for IR Program staff, which is now accessible on the IR web page at: http://lasp-nts1.gsfc.nasa.gov/lasp_only/branch_list.html.

- The organization diagram is updated and reflects the newest room assignments resulting from the building renovation.

As described above, the long-term goal of this effort is aimed toward development of an IR Program web page as the primary database for IR Program reference material.

Other database development and maintenance included:

- The task leader updates and edits the IR staff experience (Biographies) database on the IR web site. This involves eliciting information from the staff and incorporating it into the IR web page.

- Maintenance of a travel surveillance database is continuing. This ensures that the IR Program's travel expenditures do not exceed the travel budget. The tracking is done on a trip-by-trip basis via interaction with the branch Resource Analyst.

400 Visiting scientist travel support

Non-Local Travel

None

METRIC EVENTS

101   **Develop and maintain a Branch annual calendar online. Deliver updated hardcopies quarterly as part of contract's Quarterly reports.**
        Completion dates: June 19, 2001
        September 19, 2001

        Comments: The Branch's annual calendar is maintained and kept updated online. Hard copies are attached to the Quarterly Reports.

102   **Develop and maintain appropriate e-mail lists (e.g. for engineering, scientific, civil service, and contractor staff, and for specific projects) for circulation of relevant Branch information. Deliver updated lists quarterly as part of contract's Quarterly reports.**
        Completion dates: June 19, 2001
        September 19, 2001

        Comments: E-mail lists for the IR Program are updated and maintained online and are now accessible on the IR branch website. The list now includes long-term visitors as well as 685 staff. Hard copies are attached to the Quarterly Reports.

103 **Develop and maintain a Branch website**
Draft completion date: August 31, 2001

Percent complete: 50%

Comments: The e-mail/telephone extension list is now updated on the IR Branch website. This e-mail/ telephone list is currently accessible on the IR Branch website at: http://lasp_nts1.gsfc.nasa.gov/lasp_only/branch_list.html. The IR branch web page will continue to be maintained and updated as necessary. The updating of the e-mail/telephone extension list is now completed with the most current information on branch employees. Continuing HTML courses, available on-site, are being utilized to maintain HTML skills.

201 **Branch proposal support**
Completion dates as driven by Announcements of Opportunity

Comments: Staff continues to provide logistical support for proposals as required.

BRANCH 685 - E-mail Addresses/Extensions

Civil Servants	Extension
Charles.L.Bennett@gsfc.nasa.gov	x 3902
Ec@cobi.gsfc.nasa.gov	x 5038
Danchi@snoopy.gsfc.nasa.gov	x 4584
Eliahu.Dwek.1@gsfc.nasa.gov	x 6209
mino@stars.gsfc.nasa.gov	x 7509
(Mino Freund)	
Matthew.A.Greenhouse.1@gsfc.nasa.gov	x 0596
Gary.F.Hinshaw.1@gsfc.nasa.gov	x 0851
Alan.J.Kogut.1@gsfc.nasa.gov	x 0853
John.C.Mather.1@gsfc.nasa.gov	x 8720
Samuel.H.Moseley.1@gsfc.nasa.gov	x 2347
Richard.A.Shafer.1@gsfc.nasa.gov	x 3463
Robert.F.Silverberg.1@gsfc.nasa.gov	x 7468
Edward.J.Wollack.1@gsfc.nasa.gov	x1379

Contractors

HST

Dc@stars.gsfc.nasa.gov	x 0872
(Dave Cottingham)	
amr@buckeyball.gsfc.nasa.gov	x 9629
(Ann Marie Russell)	
esharp@tophat.gsfc.nasa.gov	x 3690
(Elmer Sharp)	

MAP

George.L.Canter.1@gsfc.nasa.gov	x 7346
Bgriswol@pop200.gsfc.nasa.gov	x 3381
(Britt Griswold)	
Michael.R.Greason.1@gsfc.nasa.gov	x 4529
Weiland@omega.gsfc.nasa.gov	x 5749
(Janet Weiland)	

TOPHAT

Bier@stars.gsfc.nasa.gov	x 5079
(Alex Bier)	
dicamillo@stars.gsfc.nasa.gov	x 8445
(Barbara Campano)	
tchen@stars.gsfc.nasa.gov	x 7098
fixsen@stars.gsfc.nasa.gov	x 0873
(Dale Fixsen)	

Other Contractors   *Extension*

Arendt@stars.gsfc.nasa.gov	x 8607
(Richard Arendt)	
Dominic.Benford.1@gsfc.nasa.gov	x 8771
buchanen@stars.gsfc.nasa.gov	x 5018
(Ernie Buchanen)	
Kashlinsky.@gsfc.nasa.gov	x 2176
(Alexander Kashlinsky)	
Alexander.S.Kutyrev.1@gsfc.nasa.gov	x 2150
Mirel@stars.gsfc.nasa.gov	x 4382
(Paul Mirel)	
phillips@Friday.gsfc.nasa.gov	x 8679
(Nicholas Phillips)	
powers@stars.gsfc.nasa.gov	x 7659
(Tim Powers)	
rebar@stars.gsfc.nasa.gov	x 7860
(Joyce Rebar)	
Thomas.J.Sodroski.1@gsfc.nasa.gov	x 9275
Staguhn@stars.gsfc.nasa.gov	x 0956
(Johannes Staguhn)	
Priscilla.Struthers@gsfc.nasa.gov	
	x 0850
zhang@stars.gsfc.nasa.gov	x 4639
(Xiaolei Zhang)	

Long Term Visitors

Felten@stars.gsfc.nasa.gov (Jim Felten)	x 6364
gorkavyi@stars.gsfc.nasa.gov	x 8197
cholt@jhu.edu (Christopher Holt)	x 4559
Tom Kelsall (Retired)	x 7865
long.stsci.edu (Knox Long)	x 7422
peng@omega.gsfc.nasa.gov (Peng Oh)	N/A
ozernoy@stars.gsfc.nasa.gov (Leonid Ozernoy)	x 0849
satyapal@stars.gsfc.nasa.gov (Shobita Satyapal)	x 8184

WFC3

Greg@tophat.gsfc.nasa.gov (Greg Delo)	x 7806
Eskin.@stars.gsfc.nasa.gov (Tammy Eskin)	x 3994
Glasser@stars.gsfc.nasa.gov (Kathy Glasser)	x 0874
hill@tophat.gsfc.nasa.gov (Bob Hill)	x 8531
johnson@tophat.gsfc.nasa.gov (Scott Johnson)	x 3673
mlacorte@tophat.gsfc.nasa.gov (Michael Lacorte)	x 7891
epolidan@stars. gsfc.nasa.gov (Elizabeth Polidan)	x 4689
edward@tophat.gsfc.nasa.gov (Ed Wassell)	x 5352
yiting@tophat.gsfc.nasa.gov (Yiting Wen)	x 3314

BRANCH CALENDAR

July	Aug.	Sept.	Oct.	Nov.	Dec.
1st Week of July - Call for Cap. equipment	**1st Week of Aug. -** Cap. Equipment due	**Sept. 1 -** Call for SOWs	**Oct. 1 -** SOWs due		
Mid. July Observatory Rpt. assig.	**Mid-August** Observatory Rpt. due				
July 15 - Reminder of NRC Dead.	**Aug. 15 -** NRC Deadline				
Mid. July - Call for Annual NASA Awards	**Aug. 18 -** DDF Call	**Sept. 15 -** **Reminder** to do perf. reviews for everyone **but** Mather & Moseley		**Nov. 15 -** Call for GSFC 2nd Quarter Awards	**Dec. 15 -** Reminder of NRC Deadline
		Sept. 17 - NASA Merit Award due			
	Aug. 31 - ATP Proposals Due	**Sept. 24 -** DDF due			
Late July - GSFC 1st Quarter Awards due	**Late August -** Begin compiling branch travel for upcoming year	**Sept. 30 -** Performance reviews due: Cheng Danchi Freund Greenhouse Hinshaw Kogut Silverberg Wollack		**Nov. 2001 (date?)** (Date to be determ.) Visiting comm.arrives	
Late July - Call for Merit Award Nominations	**Late August -** Annual NASA Awards due		**Late Oct. -** Branch travel input due	**Late Nov. -** Cash Awards call	**Late Dec. -** GSFC 2nd Quarter Awards due

BRANCH CALENDAR

January	February	March	April	May	June
Mid-Jan. - Cash awards due	**Feb. 5 -** Call for ATP Proposals				
Mid. Jan. - Call for GSFC 3rd Quarter Awards					
Jan. 15 - NRC Deadline					**June 15 -** Call for GSFC 1st Quarter Awards
Jan. 19 - Call for ADP Proposals		**March 15 -** Reminder of NRC Dead.	**April 15 -** NRC Deadline	**May 6 -** ADP Proposals Due	
			Mid-April - Call for GSFC 4th Quarter Awards	**May 15 -** Do Perf. reviews: Mather & Moseley	
				Mid-May RTOP Summary Call	**Mid-June** RTOP Summaries due
	Late Feb. - 3rd Quarter GSFC Awards Due			**Late May -** 4th Quarter GSFC Awards Due	
				Late May - Perf. Reviews due for Mather & Mosely	

INFRARED ASTROPHYSICS BRANCH
CODE 685 ORGANIZATION CHART

Branch Head		
C. Bennett	059	3902

IR Program Support Specialist		
S. Wright	166	8528

Civil Servants

Name	Room	Ext.
D. Benford	222	9832
E. Cheng	253	5038
W. Danchi	160	4586
E. Dwek	232	6209
M. Freund	281	7509
M. Greenhouse	104	0596
G. Hinshaw	138	0851
A. Kogut	059B	0853
J. Mather	108	8720
H. Moseley	130	2347
R. Shafer	222	2596
R. Silverberg	216A	7468
E. Wollack	134	1379

Contractors

Name	Room	Ext.
HST		
D. Cottingham	257	0872
A. Russell	257	9629
E. Sharp	249	3690
MAP		
G. Canter	067	7346
B. Griswold	063	3381
M. Greason	065A	4529
M. Limon	063D	5317
J. Weiland	063C	5749
TOPHAT		
A. Bier	241	5079
B. Compano	265	8445
T. Chen	241	7098
D. Fixsen	257	0873
OTHER		
R. Arendt	C129	8607
E. Buchanan	163	5018
D. Humberson	071	5109
S. Kashlinsky	064	2176
A. Kutyrev	228	2150
P. Mirel	145	4382
N. Phillips	T21A	8679
T. Powers	163	7659
J. Rebar	C129	7860
T. Sodroski	181	9275
J. Staguhn	254	7840
P. Struthers	C129	0850
X. Zhang	236	4639

Long Term Visitors

Name	Room	Ext.
D. Adler	229	0956
J. Felten	L108	6364
D. Halevi	145	9462
C. Holt	125	4559
T. Kelsall	C129	7865
S. Khan	218	4065
K. Long	120	7422
K. Misselt	232	2841
L. Ozernoy	C129	0849
S. Satyapal	172	8184
M. Tanaka	234	4514
R. Windhorst	C215	TBA
V. Zubko	232	TBA

Other Contractors

Name	Room	Ext.
WFC3		
G. Delo	269	7806
T. Eskin	245	3994
K. Glasser	253	0874
R. Hill	253	8531
D. Hsu	245	0089
S. Johnson	265B	3673
M. Lacorte	245	7891
E. Polidan	245B	4689
E. Wassell	257	5352
Y. Wen	257	7540

GSFC ATR: Dr. Eliahu Dwek
Raytheon ITSS Task Leader: Dr. Richard G. Arendt

QUARTERLY REPORT: MARCH 1 - JUNE 19, 2001

TASK OBJECTIVES

The purpose of this task is to provide support for analysis of infrared (IR) emission from the Warm Ionized Medium using data from the Wisconsin H Alpha Mapper (WHAM), and to use that analysis to determine the intensity of the Cosmic Infrared Background.

WORK ELEMENTS

100 Reduction and analysis of WHAM data

200 Comparison of WHAM data with other datasets

300 Studies of the Cosmic Infrared Background

The low galactic latitude data analyzed by Lagache et al. (2000) were reanalyzed using our software. The analysis of Lagache et al. included errors for the DIRBE data but did not include errors in the H I or Hα data. Setting the H I and Hα errors to zero and using the DIRBE errors adopted by Lagache, our software gives the same results as Lagache found for the H I and Hα coefficients and for the constant term. Our errors for the coefficients are much larger than those quoted by Lagache et al., probably because her analysis does not allow for possible coupling between the parameters. We find a 4.5σ result for the Hα coefficient at 100 μm, which is much more significant than our previous results for the NEP, Lockman Hole, and HQBN regions.

Non-Local Travel

None

METRIC EVENTS

101   Repeat IR decomposition for HQB North region using adjustments to the WHAM data
recommended by Matt Haffner
Completion date: May 31, 2001

Percent complete: 100%

Comments: Completed ahead of schedule.

201   Reanalyze low galactic latitude regions studied by Lagache et al. (2000), and compare our
results with theirs
Completion date: June 30, 2001

Percent complete: 75%

Comments:

202   Write the draft section of a paper on datasets used in our analysis
         Completion date: August 31, 2001

         Percent complete: 0%

         Comments:

GSFC ATR: Dr. S. Harvey Moseley
Raytheon ITSS Task Leader: Dr. Alexander Kutyrev

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The purpose of this task is to provide technical support for development of microshutter arrays for NGST applications, and to support the development of a concept for an NGST spectrometer using such a device. Work includes optical design and evaluation of instrument performance; and fabrication, test, and evaluation of microshutter arrays for use on NGST, including mechanical analysis and comparison of measurements to models. Documentation and organizational support for this effort, including support for a follow-on proposal, are included.

WORK ELEMENTS

100 Technology development

Optical design of the imaging mode and spectroscopic modes has been completed, with current work on tolerancing of the system. The final design exceeds the requirements. The pupil imaging lens design is still under study.

Two critical design elements were the subject of revisions that significantly improved performance. The pre-optics design was redone as an all-reflective system. Also, the camera design was redone to become a near-telecentric design. The concept of the mechanical design has been developed and is currently being evaluated for thermal performance in connection with optical design.

Magnetic actuation has been demonstrated for a subarray of 32x32 microshutters. In addition, addressing and latching of microshutters has been demonstrated at room temperature.

A telescope simulator for microshutter optical array testing has been designed, developed, and built.

Different samples of microshutter arrays with magnetic coating have been tested at room and LN_2 temperatures. Surface profiles of shutter arrays have been measured at room temperatures to measure flatness. Results show that low-stress magnetic coatings do not induce noticeable curvature - the coated shutters proved to be flat within 0.25 microns. Cooling to cryogenic temperatures also does not produce noticeable changes in the flatness.

Cryogenic motors are being tested. After the discovery of problems at low temperatures, we began negotiation with the supplier to replace the motors and verify performance.

200 Instrument concept definition

Different designs of the microshutter test setup are being validated. The equipment required for tests is being identified, and sources for procurement are being located.

300 Follow-on proposal development

400 Documentation and organizational support

Staff developed and presented on June 12 a report on microshutter technology status for the ESA and the NGST Project Team.

Non-Local Travel

Staff traveled to the AAS meeting in Pasadena, presenting two posters on microshutters and the Rapid IR Visible Multiobject Spectrometer (RIVMOS), respectively.

METRIC EVENTS

101   **Optical tests of microshutters**
       Completion date: August 31, 2001

       Percent complete: 20%

       Comments: Preparations are in progress.

102   **Develop spectrograph test station for microshutters**
       First stage completion date: August 31, 2001
       Final completion date: February 28, 2002

       Percent complete: 10%

       Comments: Parts and suppliers are being identified.

301   **Support the development of a follow-on proposal**
       Completion date: TBD pending AO schedule

       Percent complete:

       Comments:

GSFC ATR: Dr. Charles Bowers
Sigma Subcontract Task
Sigma Task Leader: Ratnabali Sengupta

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The purpose of this task is to provide general software and experimental operations support to the WCT project. This work consists of three elements: (1) the development of custom control code for the WCT testbed; (2) experiment operations, conducting experiments on the WCT testbed in conjunction with other members of the WCT team, and (3) assistance in interfacing with the NGST contractors, providing training on the WCT testbed and operations as necessary.

WORK ELEMENTS

100 Development of custom control code for the WCT testbed, including developing and modifying the existing code developed for the testbed.

The MatLAB to FITS translation code was completed. The code was modified to accept a request to the Executive software for saving individual frames as well as the average of the frames. The FITS translator will allow the user to save individual frames and the dark frame as extensions with all the information in the extension header.

200 Support for ongoing experiments including experiment operations; help in design and implementation of experiments on the WCT testbed; and responsibility for recording and archiving the data obtained from the experiments.

A temperature monitoring GUI in LabView for the safety monitoring system for the Wavefront Control Testbed is under development. Several VIs (Virtual Instruments) have been developed. The LabView VIs developed so far will be tested with a GPIB PCI card from National Instruments. The final code will be delivered to the testbed area by the next quarter.

Staff provided assistance to the team in experiments using the WCT testbed. Several tests were run with the Executive software connected to the WCT testbed to take data that was analyzed by the ATR and a JPL scientist. The tests included 1) deep PSF data, 2) data taken with and without the PSF magnifier, and 3) data taken with the FSM powered on and varying sine and gaussian waves from the signal generator.

Staff attended the AAS meeting in Pasadena, CA and supported running experiments at the NGST booth on Wavefront Control.

300 Assistance in the interface with NGST contractors, providing training on the WCT testbed and operations as necessary

Staff attended two presentations by a Prime Contractor on Wavefront Control and Error Budget reports. Discussions were held with contractors at the NGST booth during the AAS conference about the Wavefront Control experiments and results were demonstrated to them.

Non-Local Travel

None

METRIC EVENTS

101   **Provide support for WCT custom control code for testbed development:**
Completion date: August 31, 2001

Percent complete: 33%

Comments: This task supports LabView code on the testbed safety monitoring system.

201   **Support design for specific experiments in ongoing WCT experiment program:**
Completion dates: TBD per WCT testbed experiment program

Percent complete: 100% as required.

Comments: Supported as required. This work is ongoing.

202   **Support operations for specific experiments in ongoing WCT experiment program:**
Completion dates: TBD per WCT testbed experiment program

Percent complete: 100% as required.

Comments: Supported as required. This work is ongoing.

203   **Develop and submit monthly log of WCT experiments designed and performed:**
Completion dates: Monthly

Approximately seven experiments were supported during this quarter.
This log is maintained at the WCT facility, on the Unix machines DCATTMOON and DCATTSUN.

GSFC ATR: Dr. John C. Mather
Raytheon ITSS Task Leader: Dr. Xiaolei Zhang

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The purpose of this task is to provide studies, models, simulations, and algorithms for wavefront sensing and optical control systems in support of the Next Generation Space Telescope

WORK ELEMENTS

100 Perform an analytical and computational modeling study of sensitivity to optical prescription

Staff became familiar with the existing software and algorithms for using phase-retrieval to do NGST wavefront sensing, and learned and practiced parallel computing on the Goddard Beowulf cluster Hive. Analytical and computational studies of the sensitivity of phase retrieval quality to the optical prescription errors, including the plate scale error, wavelength error, and exit pupil size error, were performed. The results of this study were documented in a technical memorandum, which is being completed.

200 Research methods to monitor in-situ image quality and wavefront quality during NGST observations

300 Parametrically study stability and bandwidth issues of the optical control loop

400 Liaison and reporting to REE group at JPL

Staff has been in contact with the JPL group, and has produced reports and conducted the maintenance and upgrade of the phase-retrieval software package.

Non-Local Travel

None

METRIC EVENTS

101   **Provide a technical memorandum on sensitivity to optical prescription:**
        Completion date: June 30, 2001

        Percent complete: 85%

        Comments:

201   **Provide a technical memorandum on methods to measure in-situ image quality and wavefront quality:**
        Completion date: Sep. 28, 2001

        Percent complete:

        Comments:

301   **Provide support for existing software package maintenance and upgrade**
Completion dates: on-going

Percent complete: 100%

Comments: Completed the upgrade of actuator fitting package for JPL during May.

401   **Provide brief (~1 paragraph) monthly e-mail reports to D. Katz (JPL):**
Completion dates: Monthly

Comments: Informal reports were provided.

NASA Task: 99P0016 Dynamic Magnetospheric Models Based on ISTP Data

GSFC ATR: Dr. Steven A. Curtis
Raytheon ITSS Task Leader: Dr. Nikolai A. Tsyganenko

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The purpose of this task is to develop dynamic models of the magnetospheric magnetic field allowing for variable conditions in the solar wind and including substorm-related reconfigurations of the magnetosphere.

WORK ELEMENTS

100 Module development

The mathematical modules, representing the magnetic fields from all major electric current systems in the Earth's magnetosphere, were developed and underwent initial testing by the end of 2000. In March-April 2001, this effort has been focused on assembling the modules into a new model and fitting it to the data, as described below.

200 Model development

A fitting algorithm has been developed and successfully tested. Several preliminary trial versions of the new model have been developed and fitted to the database. First fitting runs provided realistic values of all model parameters and confirmed the capability of the adopted approach to determine the response of all principal magnetospheric current systems to variable conditions in the solar wind. The new model was found to yield a significantly improved description of the field in the inner magnetosphere, in comparison with the previous one (T96).

300 Database enhancement

A large amount of space magnetometer data of Geotail (from 1994 to 1999) and AMPTE/IRM (from 1984 to 1988) satellites was processed and added to the previously compiled database. All the data records were tagged by solar wind data as measured by WIND and IMP-8 spacecraft, covering not only the times of magnetospheric observations but also 1- or 2-hour intervals, immediately preceding the magnetospheric measurements. That will allow investigating the effects of the "loading" or "memory" effects in the magnetosphere and make it possible to improve the accuracy of the model predictions.

400 Dissemination of results

Preliminary results of this task were presented at XXVI General Assembly of European Geophysical Society, and at science seminars at the Finnish Meteorological Institute and at Goddard SFC (March – April 2001). A draft of a paper for *JGR* with a detailed account of this modeling effort is under preparation. The obtained results have also been reported at the Spring 2001 AGU Meeting (Boston. May-June 2001).

Non-Local Travel

Staff traveled to the XXVI General Assembly of EGS (Nice, France, March 25-30) and to the Finnish Meteorological Institute (Helsinki, Finland, March 14-17). Between May 27 – June 2, staff traveled to the Spring 2001 Meeting of the AGU (Boston, MA).

METRIC EVENTS

101 Extend the newly developed Birkeland current model by adding the effects of strong IMF by component found in the POLAR data
Completion date: August 31, 2001

Percent Complete: 30%

Comment: A full-scale modeling study of the above effect will be carried out later on as a separate investigation of the structure of Birkeland currents, using a subset of low- and mid-altitude data.

201 Prepare and include in the existing database data from Geotail (1995-1999) and AMPTE IRM magnetometer experiments
Completion date: August 31, 2001

Percent Complete: 100%

Comment: As the Geotail mission remains healthy and keeps returning good data, the database will be periodically extended by adding the newest observations to the existing data set.

301 Develop and test fitting algorithms and create preliminary test versions of the new model
Completion date: August 31, 2001

Percent Complete: 90%

Comment: This is actually a continuing task; its strategy may vary, depending on results obtained in individual test runs. The eventual goal is to establish an optimal set of the model field sources and to find the best way to parameterize them with the solar wind input and ground-based indices of geomagnetic activity.

401 Develop simplified variants of the model magnetic field, which could be used in computer-intensive massive processing of ENA images of the magnetosphere and/or particle orbit tracing
Completion date: August 31, 2001

Percent Complete: 60%

Comment: A method of fast field line mapping was developed, based on a simple Euler potential model, fitted by least squares to the T96 model field. This research is being pursued, in part, as an attempt to implement realistic empirical field models in the processing of IMAGE spacecraft data, under a joint work with Dr. E. C. Roelof (Applied Physics Laboratory, Johns Hopkins University, Laurel).

501 Present task results at XXVI EGS General Assembly
Completion date: March 30, 2001

Percent Complete: 100%

502 Prepare a draft paper for the JGR
Completion date: June 30, 2001

Percent Complete: 80%

GSFC ATR: Dr. Joseph Nuth
Raytheon ITSS Task Leader: Dr. Ashraf Ali

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The purpose of this task is to analyze the atomic and molecular species that evaporate from refractory materials, including naturally occurring minerals. This data will be used in conjunction with data obtained from a ThermoGravimetric Differential Thermal Analysis system in order to develop quantitative models of the evaporation process.

WORK ELEMENTS

100 Module development – build the evaporation system & test to ~2000K

The success of the Pennsylvania State University effort has resulted in a decision to continue the laboratory work there, and not further pursue it at GSFC.

200 Module development – integrate furnace & Mass Spectrometer

300 Module development – test end-to-end system: begin data acquisition

400 Dissemination of results

Most work during this period was on two papers. The first is on grain formation in stellar outflows, and the second is on oxygen isotopic fractionation in the gas phase. The first paper shows that the formation process of grains in stellar outflows must be understood in terms of chemical processes. The second shows that fractionation is observed in refractory SiO dimer abundances. We expect that the papers will be submitted to the journal *Nature* within a few months.

A proposal in response to a NASA Cosmochemistry NRA was submitted in May, with the task leader as co-I, A. W. Castleman of Pennsylvania State University as PI, and the ATR as a collaborator.

Non-Local Travel

None

METRIC EVENTS

101 Design furnace system & begin fabrication:
Completion date (final form): February 28, 2001

Percent complete: 100%

Comments: The success of the PSU effort has resulted in a decision to continue the laboratory work there, and not further pursue it at GSFC.

102 Integrate furnace with Vacuum system & Power Supply: begin testing.
Completion date (final form): April 30, 2001

Percent complete:

Comments: Proceeding at lower priority, per ATR concurrence, as described above.

201 **Align evaporation furnace and mass spectrometer inlet for best transmission:**
Completion date: June 30, 2001

Percent complete:

Comments: Proceeding at lower priority, per ATR concurrence, as described above.

301 **Begin evaporation tests on natural silicates as a function of temperature:**
Completion date: August 31, 2001

Percent complete:

Comments: Proceeding at lower priority, per ATR concurrence, as described above.

401 **Present task results at Annual Lunar and Planetary Sciences Conference:**
Completion date: March 15, 2002

Percent complete:

Comments:

402 **Submit a publication on task results to JCP, MAPS or similar journal:**
Completion date: May 30, 2002

Percent complete: 80%

Comments: Papers described above are near completion.

NASA Task: 99P0036   Advanced Digital Engineering for Electric Field Experiment

GSFC ATR: Dr. Robert F. Pfaff
Raytheon ITSS Task Leader: Paulo Uribe

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The purpose of this task is to provide advanced digital engineering in support of Goddard's Electric Field Experiments. Specific areas where expertise is needed include: on board digital signal processing and a high speed burst memory that triggers when interesting events are encountered in space.

WORK ELEMENTS

Work began on this task on May 1, 2001.

100 Provide overall design for electric field digital electronics for the C/NOFS satellite

Support was provided for defining the requirements for the electronic design of the VEFI instrument. The signals to be sampled, sampling rates, modes of operation, telemetry bandwidth, instrument power, and interface with the spacecraft were defined. Parts selection and procurement for the digital electronics was also initiated.

Staff began preparing the presentation for the PDR.

200 Provide detailed design and software for digital processor and burst memory.

Design of the digital electronics began. Two microprocessors were selected to handle the high computing power required by the instrument while minimizing the electrical power consumed by it. A rad-hard version of the Intel 80C86 microprocessor was chosen to handle the low rate (1Hz-2048Hz) signals, the control of the MIL-STD-1553 interface with the spacecraft, and the command processing. Analysis of requirements versus the 80C86 execution times running at 5MHz showed a worst case scenario of 80% CPU utilization. This leaves a low margin for error, but if that percentage increases, the 80C86 can be clocked at up to 8MHz. A rad-hard version of the TI 32C30 DSP was chosen for the high rate (32KHz-2MHz) signals, digital filtering, onboard FFT computation of up to 1000 FFTs per second, and the high speed burst memory control. All the logic required to interface the microprocessors, control the ADCs, and the required peripherals will be implemented with ACTEL FPGAs. The instrument will interface to the S/C using a SuMMIT 1553 protocol chip which will access the 80C86 main memory through DMA. The design of the memory control logic as well as the DMA controller for the 80C86 has been completed and the design of the low rate ADC circuitry is underway.

300 Provide interface documentation between GSFC experiment and satellite.

400 Provide GSE software and check out as needed.

Non-Local Travel

None

METRIC EVENTS

101   **Provide overall design hardware layout, and interface information for Preliminary Design Review**
Completion date: July 31, 2001

Percent complete: 25%

Comments: Preparation of slides has begun.

201   **Provide detailed design hardware layout, and interface information for Critical Design Review**
Completion date: December 31, 2001

Percent complete:

Comments: Future activity

301   **Design, implement, and verify flight software before integration**
Completion date: September 30, 2002

Percent complete:

Comments: Future activity

401   **Participate in check out of instrument during integration and pre-launch activities**
Completion date: January 31, 2003

Percent complete:

Comments: Future activity

501   **Provide on-orbit instrument health monitoring and software upgrades after launch**
Completion date: October 31, 2003, and subsequently as needed

Percent complete:

Comments: Future activity

GSFC ATR: Dr. Jonathan P. Gardner
Raytheon ITSS Task Leader: Melanie Freed

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The purpose of this task is to provide scientific and analysis support, including preparation of publications, for the study of the morphology of galaxies in ultraviolet observations.

WORK ELEMENTS

To accommodate funding profiles, no work was done on this task during the reporting interval.

100 Data processing and reduction

200 Development of figures and text for publication

300 Editing and submission of publications

Non-Local Travel

None

METRIC EVENTS

301   Develop outline and overall design for senior thesis
Completion date: February 28, 2001

Percent Complete:

Comments:

302   Submission of publication on thesis
Completion date: TBD; expected on approximately August 31, 2001

Percent Complete:

Comments:

GSFC ATR: Dr. Sara R. Heap
ACC Subcontract Task
ACC Task Leader: Don J. Lindler

QUARTERLY REPORT: MARCH 1 – JUNE 19, 2001

TASK OBJECTIVES

The purpose of this task is to support the Goddard Internal Research and Development program, "Goddard Visualization System for Astronomy (GOVISA).

WORK ELEMENTS

Work began on this task on March 20, 2001.

100 Survey and study available public and commercial visualization software to provide a basis for make-or-buy decisions on GOVISA elements

Staff began evaluation of the use of IDL and ION (IDL On the Net) for development of search and visualization tools for multi-dimensional data from large astronomical databases. Staff attended a two-day IDL course given locally by RSI on "Object Oriented Programming and Graphics in IDL." Initial evaluation indicates that the IDL object graphics system will supply the needed capabilities for interactive 3-dimensional volume visualization and display and manipulation of multidimensional parameters. IDL direct graphics (as opposed to object graphics) currently appear to be a better approach for visualization of 2-dimension image data. Staff began surveying and testing public domain software for multivariate data analysis including principal component and cluster analyses. Currently available IDL routines should be sufficient for any principal component analysis requirements. A large number of cluster analyses packages are available without cost and selection of which package to use will vary with the analyses being performed. A selection of these packages will be installed and evaluated.

200 Carry out case-study #1

300 Carry out case-study #2

GOVISA team member K. Grogan has completed case study #2.

400 Carry out case-study #3

Staff implemented an initial version of an IDL widget program to perform galaxy photometry by a method analogous to that of SExtractor, with immediate feedback to the user of every stage. The plan is to expand this capability to multiple images at a time followed by making a quicklook color-magnitude diagram. Staff has also implemented an IDL widget for display and interactive manipulation of 3-dimensional scatter plots with the color of the data points used to display a forth parameter. This widget will be used as a part of a multivariate analysis widget currently being developed.

500 Reports and documentation

600 Support a NASA AISR proposal, emphasizing (1) visualization of astronomical data and (2) scalability of GOVISA to very large and/or remote databases

Non-Local Travel

None

METRIC EVENTS

101   In conjunction with case studies #1-3, conduct a survey of public (e.g. NCSA) and commercial visualization software. Prepare survey report (date TBD).

Percent Complete: 10%

Comments: Staff has begun evaluation of IDL object graphics and IDL ION.

102   Make formal make-or-buy analyses of supplemental software such as cluster statistics, PCA, etc (date TBD);

Percent Complete: 20%

Comments:

103   Develop a proficiency with primary visualization, analysis, and scripting languages including Interactive Data Language (IDL) and Python:

Percent Complete: 30%

Comments: Staff attended a course on "Object Oriented Programming and Graphics in IDL." Attendance of an advanced IDL Object Graphic programming course is planned for July.

201   Give a demonstration of GOVISA using the three case studies as examples
Completion date: September 4, 2001

Percent Complete: 30%

Comments: Case study 2 is complete.

501   Deliver programs and documentation, and any results from the three case studies
Completion date: September 19, 2001

Percent Complete: 30%

Comments:

502   Prepare a monthly report a) listing software developed or integrating within GOVISA, and including b) 2-sentence progress statements on each case study

Percent Complete:

Comments: These reports were decided to be unnecessary by the ATR.

601   Assist in preparation of proposal for Applied Information Systems Research
NOI due: July 27, 2001
proposal due: September 26, 2001

Percent Complete: 0%

Comments:

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15. Supplementary Notes

16. Abstract

This report covers software and science support activities for the Laboratory for Astronomy & Solar Physics at NASA/Goddard Space Flight Center.

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